R842-05 ERIC REPORT RESUME

ED 010 278 2-28-67 24 (REV)

MEASUREMENT OF SOCIAL INTELLIGENCE.

O'SULLIVAN, MAUREEN * AND OTHERS

WUV77065 UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES
CRP-1976
BR-5-0198
-JUN-65
EDRS PRICE MF-$0.09 HC-$1.84 46P. STUDIES OF APTITUDES OF HIGH-LEVEL PERSONNEL, NO. 34

*TEST CONSTRUCTION, *SOCIAL PSYCHOLOGY, *COGNITIVE MEASUREMENT, *INTELLIGENCE FACTORS, BEHAVIOR THEORIES, STIMULUS BEHAVIOR, *SOCIAL INFLUENCES, TEST VALIDITY, LOS ANGELES, CALIFORNIA, GUILFORD'S STRUCTURE OF INTELLECT MODEL

EXPERIMENTAL TESTS (23) WERE CONSTRUCTED TO MEASURE CERTAIN BEHAVIORAL-COGNITION FACTORS OF SOCIAL ABILITY. THE TESTS, AS WELL AS 24 MARKER TESTS OF SEMANTIC AND FIGURAL ABILITY, WERE ADMINISTERED TO WHITE, MIDDLE-CLASS, AVERAGE INTELLIGENCE 11TH GRADERS (240). THE STIMULI CONSISTED MAINLY OF PHOTOGRAPHS, DRAWINGS, AND CARTOONS. WORDS WERE USED AS LITTLE AS POSSIBLE. ALL SIX OF THE BEHAVIORAL-COGNITION FACTORS HYPOTHESIZED WERE IDENTIFIED IN THE ANALYSIS. NO SOCIAL INTELLIGENCE DIMENSIONS WERE DISCOVERED. IF PREDICTIVE VALIDITY COULD BE ESTABLISHED, THESE TESTS MIGHT SERVE AS JOB-SELECTION INSTRUMENTS OR TRAINING DEVICES IN A CLINICAL SETTING. (RS)

ED 010278

THE MEASUREMENT OF SOCIAL INTELLIGENCE

Cooperative Research Project No. 1976

Maureen O'Sullivan
J. P. Guilford
R. deMille

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education
This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated do not necessarily represent official Office of Education position or policy.

Studies of Aptitudes of High-level Personnel

REPORTS FROM THE PSYCHOLOGICAL LABORATORY

THE UNIVERSITY OF SOUTHERN CALIFORNIA

Number 34

The research reported herein was supported by the Cooperative Research Program of the Office of Education, U. S. Department of Health, Education, and Welfare.

June 1965

TABLE OF CONTENTS

	Page
INTRODUCTION	3
Experimental vs. Individual-Differences Approach	3
Related Research	3
HYPOTHESES	4
The Structure of Intellect	4
Definition of Social Intelligence	4
Beyond Behavioral Cognition	5
Restatement of the Hypotheses	6
ASSUMPTIONS	6
THE TEST BATTERY	6
Construction of the Experimental Tests	6
Experimental Factors and Tests	7
SELECTION OF REFERENCE FACTORS	14
The Marker Tests	14
PROCEDURES	15
The Tested Sample	15
Test Administration	15
Scoring	17
Statistical Analysis	17
The Factor Analysis	19
INTERPRETATION OF THE FACTORS	22
Reference Factors	22
Experimental Factors	23
DISCUSSION	26
Reference Factors	26
Relevance of the Reference Factors to the Interpretation of the Behavioral Factors	26
Behavioral Factors	28
Limitations of the Behavioral Tests	29
Possible Uses of the Behavioral Tests	29
Recommended Tests	29
SUMMARY	30
REFERENCES	30
APPENDIX A: DESCRIPTION OF VARIABLES	33
APPENDIX B: TARGET MATRIX FOR ROTATED FACTORS	40

LIST OF FIGURES AND TABLES

Figure 1:	Model of the Structure of Intellect	5
Table 1:	Distribution of Stimuli among 23 Behavioral Cognition Tests	8
Table 2:	Means, Standard Deviations, Distributions, Scalings, and Reliabilities of Scores	16
Table 3:	Correlation Matrix	18
Table 4:	Unrotated Factor Matrix	20
Table 5:	Rotated Factor Matrix	21
Table 6:	Comparison of Hypothesized and Obtained Factors	27

THE MEASUREMENT OF SOCIAL INTELLIGENCE[1]

Man's status as a social animal has been recognized for a long time. The prime requirement of satisfactory social existence is ability to establish relations with and to interact with others. The importance of such interaction is stressed by a variety of commentators on human life, ranging from songwriters to philosophers. A currently popular song proclaims the luck of "people who need people." Many psychotherapists claim that personality evolves only as the result of human interaction. Psychological existentialists hold the view that self awareness, consciousness of one's very existence, cannot exist in the absence of social stimulation. In maintaining life as a social being, a person must be able to predict the ways in which others will behave. In this regard, comprehension of the feelings and intentions of other people is particularly relevant.

Distinguishing joy from rage is a simple task. But as man's social life becomes more complex, the dispositional distinctions that have to be made become increasingly subtle. The finer the discrimination to be made about another's social behavior, the greater the social skill that is required.

Common sense suggests that people vary in their ability to understand other people, and that aptitude of this kind is different from general intellectual ability. Yet despite their contributions to our increased knowledge of human perception, motivation, and learning, psychologists have not been able to demonstrate satisfactorily that there is an ability to judge the mental states of others that is distinct from general or verbal intelligence. Certainly there have been no adequate measures of a person's ability to understand other people.

The present study is an attempt (1) to demonstrate that there is a separate intelligence involved in understanding other people, and (2) to provide reliable, construct-valid tests of this intelligence.

Experimental vs. Individual-Differences Approach

One name that has been given to the phenomenon of understanding other people is "social intelligence" (Thorndike, 1920). Our continuing ignorance about the nature of a construct so labeled, however, is noteworthy. This ignorance cannot be attributed to a lack of research enthusiasm.

A great deal of experimental energy has been expended in studying the phenomenon variously labeled "social sensitivity," "person cognition," or "interpersonal perception." Despite these neologisms, we know little more today about how we understand other people than when we spoke of "empathy" or "woman's intuition."

Since the thirties, most of the research concerned with "the ability to judge people" has been experimentally oriented. The methods used in these studies vary from the rating or ranking of the personality traits of peers or other target persons (Vernon, 1933; Wolf & Murray, 1937; Norman, 1953; Taft, 1950) to "predictions" about happenings in others' lives, or guesses about their answers to items of a personality test (Gage, 1952; Cline & Richards, 1960). The results from personality research of this sort have been largely contradictory, and therefore confusing. None of these experimenters has offered an operational definition of social intelligence that has been acceptable to more than a handful of social scientists.

In the face of unimpressive experimental results, it is surprising that the individual-differences approach, which is employed in the present study, has been used so little in investigating how humans understand one another's feelings and motives. Scant attention has been paid to the possibility of assessing individual differences in the ability to judge people in the same way that individual differences in other kinds of aptitudes have been measured. An individual-differences orientation would seem to be a promising one, however. An example of the usefulness of this approach is the widely accepted operational definition of abstract intelligence, as measured by standardized IQ and factor-analytic tests.

Several reasons may be suggested for the neglect of the individual-differences approach to social intelligence. One reason might be a difference in definitional emphasis. It is currently more popular to speak of "person perception" than of "social intelligence." In studying social perception, the procedures used in other perceptual studies are employed. Group tendencies are observed; and similarities, rather than differences, among persons are sought.

Other, more practical, explanations of the paucity of social-intelligence tests include difficulties in determining the "right" answers to test items and in assessing the appropriateness of test items printed on paper. Considerations such as these will be treated later in this report. At this point, we will review the few studies that have attempted to develop social-intelligence tests, using the individual-differences approach.

Related Research

Earlier attempts at devising construct-valid tests of social intelligence have not been very successful. As long ago as 1920, E. L. Thorndike suggested that, in addition to abstract and concrete intelligence, observations of everyday life suggested a third kind of ability, which he called social intelligence. In accordance with Thorndike's suggestion, Moss and his coworkers (1927) produced the George Washington Social Intelligence Test.

R. L. Thorndike (1936) factor analyzed the five subtests of this instrument along with the five subtests of the George Washington Mental Alertness Test (a general-intelligence measure) and found no social-intelligence factors.

Woodrow's (1939) factor analysis of 52 variables including the five Social-Intelligence Test subtests, as

---

[1] This study was conducted by the Aptitudes Research Project at the University of Southern California under Cooperative Research Project 1976 with the Office of Education, U. S. Department of Health, Education, and Welfare. The ideas expressed here are our own, and do not necessarily reflect the views of that agency. This material may be reproduced for any purpose of the United States Government. Among the authors, Guilford has served as Responsible Investigator and Director of the Project, O'Sullivan, as Study Leader for the social-intelligence study, and deMille, as consultant during the early stages.

well as tests of attention, musical ability, spatial ability, and general intelligence, corroborated R. L. Thorndike's findings. None of the ten factors extracted by Woodrow was represented uniquely by the social-intelligence subtests. These subtests were found to be loaded on factors defined by verbal or memory variables. Considering that almost all the items of the Moss Social-Intelligence subtests are verbally presented, and that the keyed answers are correct in the "Emily Post" sense, the high loadings of these subtests on verbal factors are not surprising.

A more promising approach to the measurement of individual differences in social intelligence was suggested in a 1933 dissertation (Wedeck, 1947) carried out under Spearman's direction. Wedeck's leanings toward "g" notwithstanding, the intent of his research was very similar to that of the present study, to demonstrate the existence of a "psychological ability" (social intelligence) different from g and verbal ability. To this end, Wedeck constructed eight psychological-ability tests which used either auditory or pictorial stimuli. The pictorial stimuli included drawings and photographs of both facial expressions and social situations. A tetrad-differences analysis of these social-intelligence tests, along with seven tests of verbal and spatial abilities, resulted in three non-orthogonal clusters. Wedeck named these factors, g, for general intelligence, v, for verbal ability, and ψ, for psychological ability.

For the purposes of the present study, Wedeck's correlation matrix was reanalyzed using the principal-factor method. This factor-analytic solution, when rotated to the varimax criterion, yielded five interpretable factors. The first of these factors was a verbal cluster, the second, a figural (spatial) grouping, and the remaining three factors were defined by the psychological-ability tests. Wedeck's success in demonstrating social-intelligence factors with tests using visual stimuli should be noted. This is the kind of stimuli most often relied upon in constructing tests for the present study.

HYPOTHESES

The main hypothesis of this study is that social intelligence comprises a group of intellectual abilities each of which is demonstrably independent of previously identified intellectual factors.

An important feature of this hypothesis is the definition of social intelligence as encompassing many different intellectual abilities. Factor-analytic research has indicated that Thorndike's "abstract intelligence" is too broad and vague an entity to be descriptive of the way man thinks. Since the thirties, a variety of verbal and symbolic factors, roughly comparable to Thorndike's "abstract intelligence," have been identified and substantiated. It was expected, then, that Thorndike's "social intelligence" would involve, not one ability, but many different ways of being socially intelligent.

In hypothesizing what these ways of being socially intelligent are, a systematic theory of human intellect, Guilford's SI (structure-of-intellect) model, was used. The SI model was the only theory offering any hypotheses about the organization of social intelligence viewed as intellectual ability.

The Structure of Intellect

The ideas basic to the SI theory were promulgated by Guilford in 1955, and were refined in publications in 1956, 1957, 1958, and 1959. The version of the model used in the present study is that presented by Guilford and Merrifield in 1960.

The SI model is a three-way classification of intellectual factors designed to encompass known aptitude factors and to predict the existence of undiscovered ones. The model serves a function similar to that of Mendeleeff's table of chemical elements.

The three dimensions of the SI model specify (1) the content, (2) the operation, and (3) the product of a given intellectual act. The theory hypothesizes four kinds of intellectual content—semantic, symbolic, figural, and behavioral. Semantic content is most often encountered in standard aptitude tests that demand recognition of word meanings. Symbolic content refers to information such as numbers and letters, which have no significance in themselves. Musical and mathematical notations are two examples of this content area. Information that is concrete or perceivable as space or contour is said to inhabit the figural-content area. A synonym for figural is spatial.

The fourth content area is that with which the present study is most directly concerned—the behavioral one. The domain of behavioral intelligence was added to the SI model solely as a theoretical extrapolation. The kinds of information subsumed under this content area include feelings, motives, thoughts, intentions, attitudes, or other psychological dispositions which might affect an individual's social behavior.

The operation dimension of the SI model includes intellectual processes or activities—what the organism does to any particular kind of content. Five different intellectual operations are hypothesized: cognition, memory, divergent production (generation of variety of output), convergent production (generation of the one correct solution), and evaluation (judging in terms of criteria).

The product dimension includes the results of intellectual processing. The six product categories are as follows: units (elements having "thing" character), classes (aggregates, the members of which have common properties), relations (connections between units), systems (organized or structured information), transformations (changes or redefinitions in known information), and implications (extrapolations in the form of predictions or antecedents).

Each intellectual factor may be uniquely described in terms of one of four content areas, one of five operations, and one of six products (see Figure 1). The structure of intellect predicts the existence of 120 separate intellectual abilities. Spearman would most certainly have disagreed with such a large number of separate aptitudes. However, apart from behavioral abilities, 64 intellectual factors have been isolated, many of them suggested by the structure-of-intellect theory before they were empirically demonstrated.

In view of the earlier failures to establish the factorial existence of a social intelligence, any success the present study may have in demonstrating behavioral-intelligence factors would also indicate the usefulness of the SI model.

Definition of Social Intelligence

Within the behavioral-content area, the SI model predicts the existence of 30 different social—or behavioral—intelligence factors (six products for each

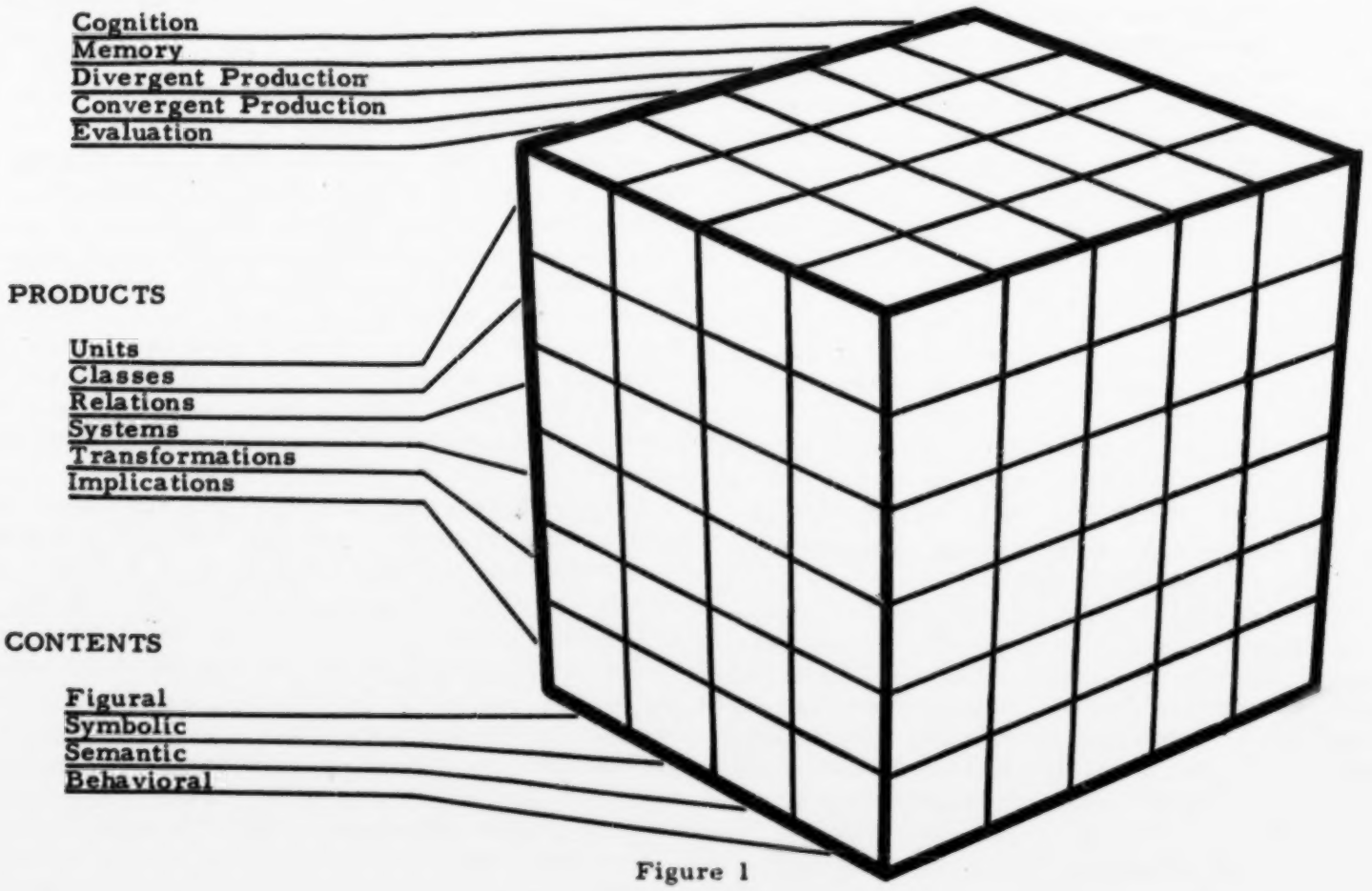


Figure 1

Model of the Structure of Intellect

of the five operations). These factors are suggested by analogy to factors already known to exist in the other content areas.

The demonstration of 30 new factors at one time is not presently feasible. For this reason, the first phase of this investigation of social intelligence concentrated on the six factors of behavioral cognition: (1) cognition of behavioral units, (2) classes, (3) relations, (4) systems, (5) transformations, and (6) implications. An investigation of these cognitive or comprehension abilities is held to be fundamental, basic to the later exploration of other kinds of behavioral intelligence.

As indicated at the beginning of this report, behavioral cognition or behavioral understanding, the "ability to judge people," is what many psychologists mean by the term "social intelligence." In the present study, behavioral cognition is defined as the ability to understand the thoughts, feelings, and intentions (psychological dispositions) of other people.

This comprehension of other people does not include comprehension of the generalized-other (the average college sophomore, the middle-class American housewife). Some empathy tests are concerned chiefly with such stereotypic understanding (Kerr, 1957), but Bronfenbrenner and his colleagues (Bronfenbrenner, Harding, & Gallwey, 1958) have clearly distinguished this kind of social sensitivity from that involved in knowing the feelings of a given individual. The present study is limited to an investigation of the understanding of individual others, not average others.

In addition, for the purposes of this study, behavioral cognition is not considered to include the understanding of one's own motivations and feelings. Such comprehension may involve other aptitudes or traits, such as the ability to be objective about one's self as readily as about another person.

Beyond Behavioral Cognition

Although the first phase of the present study deals only with behavioral cognition, the importance of the other behavioral operations should not be overlooked. A person might understand a social situation (behavioral cognition) and be incapable of doing anything about it. To know is not to do. Yet the person who can do, in a social situation, possesses an aptitude indispensable for social functioning.

Two intellectual operations of the structure of intellect are particularly concerned with this "doing" aspect of social intelligence. Doing just the right thing at the right time is the kind of ability subsumed under behavioral convergent production. Social creativity, or being able to get out of, or into, a social situation through the production of many or unusual behavioral maneuvers, is considered behavioral divergent production. A follow-up phase of this study is concerned with the development of means for identifying the socially creative, using as guidelines the results of the behavioral-cognition analysis.

To round out the picture, the two remaining behavioral operations should be mentioned. Behavioral memory is crucial for politicians, administrators, and psychotherapists, who must remember the social characteristics of their constituents, cohorts, and clients. The ability to make judgments about another's behavior (behavioral evaluation) is particularly necessary for jurists, clergymen, educators, and all those who are concerned with the appropriateness of behavior.

Restatement of the Hypotheses

Having indicated the vastness of the terrain, the necessity of first establishing a few landmarks is clear. Therefore, the first phase of the present study was confined to an exploration of the six hypothesized factors of behavioral cognition already described. The main hypothesis of this study is that there are six separate, intellectual abilities involved in understanding other people, and that each of these is factorially distinct from previously isolated intellectual abilities.

ASSUMPTIONS

Intellectual activity is based very much on sensory input. There is no reason why behavioral intelligence should be an exception. Feelings and motives, the "stuff" of behavioral cognition, are not tangible to the outside observer. Therefore, sensory representatives, carriers of these intentional states, are needed.

In this study, it is assumed that expressive behavior, more particularly facial expressions, vocal inflections, postures, and gestures, are the cues from which intentional states are inferred. Comprehension of the manifest cue is taken to be equivalent to knowledge of the emotional state underlying it. Thus, behavioral cognition is more fully defined as the ability to understand the thoughts, feelings, and intentions of other people as manifested in discernible, expressional cues.

Ideally, in measuring social intelligence, "...a genuine situation with real persons..." (Thorndike, 1920) would be used. Practically, such a real-life situation is prohibitively uneconomical. The factor-analytic paradigm demands a large sample of examinees and several tests for each factor under investigation. For the purposes of the present study, the situational requirements would mean that each of at least 200 subjects be given each of at least 18 situational social-intelligence tests.

For the sake of economy, then, it was necessary to devise tests which used less than life-size stimuli. In the present study, the stimuli used were photographs, drawings, cartoons, and tape-recorded words and sounds. At first, it was hoped that motion-picture tests of behavioral intelligence could be constructed, motion pictures being closer to real life than static stimuli. The activity dimension added to expressional behavior by motion pictures was also an important consideration. The rapidity and smoothness with which an expression is executed may add greatly to its communicative value. However, cost prohibited motion-picture tests of behavioral cognition. Furthermore it was believed that the more complex stimuli provided by normal motion-picture scenes would lead to factorially complex tests, where univocal tests were wanted.

Taft (1955) has criticized the use of photographs and drawings of expressions in social-intelligence research. He believes that the emotions so portrayed are stereotypic rather than idiosyncratic, and that the investigator of social intelligence is more properly concerned with the latter. It is doubtful whether the breach between the communicative-idiosyncratic expression, and its stereotypic counterpart, is as great as Taft suggests. Certainly, the one is the basis for the other. An understanding of the usual way of expressing a feeling would seem requisite for more refined comprehension. In the present study, it is assumed that understanding of stereotypic expression is tantamount to comprehension of veridical-idiosyncratic expression.

Despite the many criticisms raised against it, the use of two-dimensional stimuli, such as photographs and drawings, in judging the communication of emotion, has a long history (Ruckmick, 1921). Recently, even stimuli such as stick figures and silhouettes have been used to assess social-cognitive processes.

If one is willing to assume that an emotionally disturbed person is at least temporarily deficient in social intelligence, some indirect evidence supporting the validity of two-dimensional stimuli in assessing this ability may be cited. Sarbin and Hardyck (1955) have reported that schizophrenics are inferior to normal persons in attributing a modal-behavioral intention to drawings of stick figures. Using silhouette profiles, Knapp (1963) found that mental-hospital patients were inferior to unhospitalized individuals in detecting interactional behavior in silhouette diads.

Stimuli such as stick figures and silhouettes seem even further removed from real life than photographs and drawings of expressional behavior. If stick figures and silhouettes discriminate between two groups assumed to be different in mean social intelligence, equal utility may be expected from photographs and drawings.

Tests using words have failed to define factors of social intelligence in the past. Because of this, the present study has relied almost entirely on photographs, drawings, and auditory stimuli. Wedeck's success in isolating social-intelligence factors with tests using such stimuli has been noted.

This neglect of verbal stimuli does not mean that verbal information cannot be behavioral in nature. Verbal is not synonymous with semantic. Just as semantic, non-behavioral information can be conveyed pictorially, behavioral information can be expressed verbally. However, bearing in mind the earlier factor-analytic results, only a few behavioral tests use verbal-behavioral stimuli.

THE TEST BATTERY

Construction of the Experimental Tests

The behavioral tests constructed for this study employed photographed, drawn, and other less than real-life depictions of intentional or emotional states. These kinds of stimuli have been used before in studies of judging emotion (Boring & Titchener, 1923; Buzby, 1924; Landis, 1924; Dunlap, 1927). However, factor-analytic test construction in which such stimuli are used presents special problems. Adequate assessment of the reliability of a test and the discriminating power of its items requires that the test be pretested using relatively large groups of examinees. Group pretestings of photographed items necessitate printed tests, which are expensive.

To circumvent unnecessary expense, for most of the behavioral tests a pool of about 40 items per test was prepared. These "tests" were then administered individually to about 30 examinees. On the basis of these informal pretestings, testing time was ascertained, and the 30 best items selected for the printed form of the test. If 30 good items (good in terms of consensual validation of the key and discrimination between high- and low-scorers on the total test) were not found, additional items were written or the number of items in the printed form of the test reduced. [2]

[2] Mr. Lynn Rehm and Mr. Barry Karp deserve credit for contributions to the construction of several of the behavioral tests.

The printed test was then group pretested. Such pretestings indicated that some of the items in the printed tests were not good discriminators. If the reliability was acceptable, however, the test was retained in its initially printed form for administration in the final test battery.

In constructing the behavioral tests, three approaches were used. The strategy used most often was to construct a behavioral-cognition test by analogy to an existing SI test in another content area. For example, a test commonly used as a measure of the verbal-comprehension factor (cognition of semantic units, or CMU in SI terminology) presents the examinee (E) with a word. E is to indicate understanding of the meaning of the given word by choosing, from among several alternatives, the one word that means about the same thing. It is expedient in devising a test of CBU (cognition of behavioral units) to use the same test format, merely replacing the stimuli with new ones appropriate to the behavioral-content area.

Representing the unit in the behavioral domain by an expression, the test constructor may then present E with a photographed or drawn facial expression. E's task is to indicate comprehension of the behavioral meaning of the expression by choosing an alternative expression that conveys the same feeling.

In an area so full of uncertainties as that of social intelligence, this test-construction strategy is especially needed. It can suggest test ideas that inspection of the raw material of the social situation would never call to mind. There are disadvantages, however. By adhering too closely to a test-construction paradigm that only parallels tests defining other factors, one may unnecessarily confine, and even distort the factors which emerge, and so obscure rather than illuminate the relevant abilities.

The second method of test construction used in this study is also firmly rooted in the SI theory. The position of a hypothesized factor in the model automatically carries with it a description of the factor. From this description, test ideas often result. Cognition of behavioral relations (CBR) means the ability to understand social relationships. A very common, observable social relationship is the diadic or two-person one. A test hypothesized to measure the factor CBR might present a variety of diads. The comprehension of these pair-relations may then be assessed in the usual multiple-choice test format.

The paper-and-pencil nature of the behavioral tests constructed for this study dictated the predominant use of test construction by analogy or definition. However, an effort was made to conceptualize behavior that was socially intelligent in a context other than that of the structure of intellect, and then to fit such behavior into a test format consonant with the model. Examples of this third test-construction approach include an attempt to define a particular kind of humor as a behavioral ability (Who Said It?), and the construction of a test based on a psychotherapeutic technique, "reflection of feeling," (Reflections).

In the discussion of behavioral and marker factors which follows, the individual tests will be described only briefly. Further information, as well as sample items, may be found in Appendix A.

Experimental Factors and Tests

CBU = Cognition of behavioral units.

As already stated, the unit or element of behavioral content was represented by an expression, whether a facial expression, a vocal inflection, a gesture of the hand, or a posture of the entire body. A variety of such expressions was drawn,[3] suggested in part by Krout's (1935) list of autistic gestures. The facial expressions in this group of drawings used as models the Marjorie Lightfoot series of photographed facial expressions (Engen, Levy, & Schlosberg, 1957; 1958) and photographs of the actor Fernandel (Halsman, 1949). This first group of drawings was reproduced, and several of the individual drawings, particularly those of postures and hand gestures, were used more than once. A second group of drawings, mostly of facial expressions, was produced, using as models expressions found in books of movie stills, newspaper and magazine photographs, and the expressive behavior of Project personnel. Drawings in this second pool were seldom used twice.

Of all the behavioral-product factors, the task of devising tests hypothesized to measure CBU was perhaps the easiest. For three of the four CBU tests, Expressions, Faces, and Inflections, test construction by analogy dictated the easily followed vocabulary-test format. A fourth CBU format, as exemplified in Questions II, was discovered serendipitously.

Expressions—Indicate comprehension of a drawn expression by choosing the one of four alternative drawings that expresses the same feeling. Of concern in investigations of SI factors is the equivalence of units within a content area. In studying symbolic evaluation (Hoepfner, et al., 1964), for example, it was necessary to determine whether both letters and numbers might be considered symbolic units. In the present study, the equivalence of facial expressions, vocal inflections, gestures, and postures as cues for behavioral units was assumed.

Ideally, only one expressional mode would be used in each behavioral-units test. If these single-mode tests, each using a different expressional mode, were loaded on the same factor, the unit-equivalence of expressional modes might be reasonably inferred. Unfortunately, the more than 100 different hand gestures or body postures required for each test (30 items per test, with four stimuli per item) are not easily produced.

As an alternative, Expressions was constructed to include all manner of static-visual expressions. Given, for example, a drawing of a clenched fist, the correct answer might be an angry face. Care was taken to include distractors similar in mode and general appearance to that of the given; a distractor for hands-on-hips in anger might be hands-on-hips, relaxing.

Pretesting results indicated that the Es found hand gestures the most difficult to interpret. This difficulty may reflect an experiential bias; few Americans are as flamboyantly expressive as Mediterraneans, whose gestures are routinely used to caricature them.

Faces—Choose the one of four photographed men's faces that expresses the same feeling as that of a woman's face. Facial expressions are probably the most

[3] The stimuli used in this study were drawn by Mr. Peter Plagens, Mr. Walter Gabrielson, and Mr. Cheh Nam Low.

Table 1

Distribution of Stimuli among 23 Behavioral Cognition Tests[a]

Products	Cartoons	Drawings	Photographs	Sounds	Words	Others
Units		Expressions (Inflections)	Faces Questions II	Inflections	(Questions II)	
Classes	Odd Strip Out	Expression Grouping	Picture Exclusion	Sound Meaning	(Sound Meaning)	
Relations	Social Relations	Cartoon Analogies	(Silhouette Relations)		(Social Relations)	Silhouette Relations Stick Figure Opposites
Systems	Missing Cartoons		Missing Pictures Facial Situations		(Facial Situations)	
Transformations	Cartoon Exchange	Expression Exchange	Picture Exchange Who Said It?		Social Translations (Who Said It?)	
Implications	Cartoon Implications Cartoon Predictions			Reflections	(Reflections) (Cartoon Implications)	

[a] Parenthesized test names indicate stimuli combinations. Column in which parentheses occur is that of the less important stimulus.

obvious and often-used expressional cues. Thus, the measurement of the ability to comprehend facial expression would seem requisite for understanding the larger cognition of another's intentions. Faces was constructed to fill this need.

Photographs were used in this CBU test to satisfy the demands of good experimental design. It seemed desirable to counterbalance as much as possible the kinds of stimuli used in tests of the same factor so as to prevent an artifactual photograph or drawing factor from occurring. For this reason, in constructing tests for each of the behavioral-cognition factors, tests were designed to span stimuli types. Table 1 describes the distribution of kinds of stimuli among the 23 behavioral tests, over the six product factors. Faces follows this paradigm, being a photographic analog of Expressions.

The Marjorie Lightfoot and Frois-Wittman (Hulin & Katz, 1935) series of photographs were used in Faces, because the grant under which this study was initiated was not budgeted with sufficient funds to produce new photographic material.[4] At first, an attempt was made to key the items of Faces according to the scale values published for both series of pictures (Schlosberg, 1952; Levy & Schlosberg, 1960). Such pairings, however, were so obvious as to be useless in a test from which it was hoped normally distributed scores could be derived.

Inflections — Choose the one of four drawn facial expressions that expresses the same feeling as a tape-recorded vocal inflection. To determine whether vocal inflections might be cues for behavioral units, the test called Inflections was constructed. First, six socially neutral phrases (yes; mother; I did it; well; really; and that's good) were selected. Each of these phrases

[4] The following tests were constructed under Grant G-18074 from the National Science Foundation: Expressions, Faces, Matching Expressions, Face Grouping, Social Relations, Missing Cartoons, Facial Situations, Cartoon Exchange, Social Translations, Cartoon Implications, Questions, and Writing Inner Thoughts.

has quite different social meanings if said with different inflections.

Three actors produced a variety of inflections for each of the six phrases. Some of the inflections were suggested by the test constructor; others were spontaneously produced by the actors. From this pool of tape-recorded inflections, five different inflections were chosen for each of the six "neutral" phrases. The final test is composed, then, of 30 inflections — six different phrases, each said with five different inflections.

For each item of the test, the same inflection was mechanically reproduced [5] on tape four times to permit E to match the inflection with each of the four alternative facial expressions in turn. The items of Inflections are alternated according to sex, half of the inflections and corresponding facial expressions being male and half female.

Questions II — Choose the one of four alternative questions that might have provoked a given photographed facial expression. Halsman's The Frenchman (1949) suggested a test, known as Questions, which was originally intended as a measure of cognition of behavioral implications. Each item of this test presented a picture of the face of Fernandel, with four accompanying questions. One of these questions might have been the stimulus for the particular expression shown. It was thought, at first, that the correct question would be selected as an implication from Fernandel's expression (an extrapolation to an antecedent). However, correlations indicated that success at the task depended on the cognition of the facial expression, the question alternatives serving as a rather direct means of assessing this comprehension. Therefore, following extensive item analyses, Questions was rewritten as a units test and called Questions II.

CBC - Cognition of behavioral classes.

By definition, a class is an aggregate, a set whose members possess a common attribute. It is all too easy in constructing tests of behavioral classes to group expressions into sets that make semantic sense but may not reflect behavioral aggregates. For example, "nervousness is a class under which many behaviors may be subsumed. The question, however, is whether "nervousness" is a label for a genuine behavioral set, or just a semantic expediency. Behavioral classes may well be semantically ill-defined feeling groups, such as inward, against, negative, or active. So as not to prejudice the behavioral-classes tests in the favor of those who are capable of verbal niceties, groups formed on the basis of gross-feeling states were used at least as often as those suggested by verbal labels. In addition, in the four classes tests used in the final battery of this study, three formats are represented: grouping, exclusion, and naming.

Expression Grouping — Choose the one of four drawn expressions that goes with a given group of three expressions. Expression Grouping is a test having a grouping format (Which of these alternatives goes with this group?) and using the same stimuli as were used in the units test, Expressions. This classes test is based on an earlier CBC test, Matching Expressions.

In Matching Expressions, sets of three groups of three expressions each were presented to E. His task was to choose, from five alternatives, three expressions each of which belongs with one of the groups given. This format was unsatisfactory, however, because the items were not independent. If E chose alternative A to class with group 1 and alternative A really belonged with group 2, he would fail both items.

The items in Expression Grouping used essentially the same groups as were used in Matching Expressions, but the alternatives to be classed with them are presented separately for each item. Most of the item-groups in this test are semantically specifiable ("scolding," "admiration"), but a few "feeling-tone" groups were included as well.

Picture Exclusion — Choose the one of four photographed expressions that does not belong with the other three. Picture Exclusion, an exclusion-type test, uses photographs of hand gestures, facial expressions, and body postures (with the faces blocked out) which were produced especially for it. The actors were, for the most part, college drama and physical-education majors.

Although an attempt was made to have four different expressional modes for each item, not enough head-shoulder inclinations were available for this purpose. Most items, therefore, contain two pictures of faces (of different actors), one of a body, and one of hands. Almost all the items in Picture Exclusion are of the difficult-to-verbalize, "feeling-tone" type.

Results from pretesting indicated that most Es answered the items in Picture Exclusion on the basis of the facial expressions alone. To control for this tendency to respond only on the basis of facial expression, the instructions for Picture Exclusion emphasize the necessity of using all four pictures in answering each item.

Although Picture Exclusion is the only photographic-classes test used in this analysis, another CBC test using the Lightfoot and Frois-Wittman pictures had been developed and was called Face Grouping. Each item of this classes test presents E with a group of three facial expressions. The task is to group one of two alternative facial expressions with the given set.

The reliability of Face Grouping was exceedingly low. The small number of alternatives and the negative reactions occasioned by the Frois-Wittman pictures may well have sponsored random test-taking behavior. No further use was made of this test.

Odd Strip Out — Choose the one of three cartoon strips in which the cartoon character, Ferd'nand, responds differently than he does in the other two. Most usually, the members of classes are thought of as units, as in Expression Grouping and Picture Exclusion. This need not always be the case.

In Odd Strip Out, the class members are behavioral systems, organized sequences of social behavior. Specifically, the systems in this test are the personality traits of the main cartoon character, Ferd'nand. The sample item for Odd Strip Out given in Appendix A shows Ferd'nand being oblivious to the feelings of others. This characterization is inferred not from one cue or expression but from the continuity of Ferd'nand's reactions in a complex social situation.

Parenthetically, the Ferd'nand cartoon strip (Mik, 1960; 1961; 1962; 1963; 1964) was used in Odd Strip Out as well as in several of the other behavioral tests because its cartoon characters interact and react almost

[5] We are happy to acknowledge the technical contributions of Mr. Harold Borden and Mr. Robert Crutchfield to the construction of the auditory-behavioral tests.

entirely in pantomime. Non-verbal communication of this type is eminently suited for use in tests of behavioral intelligence.

Pretesting results indicated that Odd Strip Out was a difficult test for most of the Es. In attempting to avoid unduly stereotypic characterizations (the miser, the angry boss, the henpecked husband) fairly subtle cartoon strips were used. This subtlety may have increased the systems comprehension necessary for success in this test.

Sound Meaning—Choose the one of four words that describes a tape-recorded group of three emotive sounds. Although intonation or inflection of voice in speech is an important communicative device, nonverbal auditory cues may also provide behavioral information. A scream, a laugh, a sigh, a whistle—each can convey different moods and emotions.

In Sound Meaning, classes were formed from three such emotive sounds. (The sounds were made by two non-actors, a male and a female.) These three-sound groups were mechanically duplicated on tape. E's task was to indicate comprehension of the class property of the sound group by choosing the most appropriate of four class names. These class names were suggested in part by Allport and Odbert's (1936) list of trait names.

One item in Sound Meaning presents the three tape-recorded sounds: heavy breathing, a startled laugh, and a whimper. The emotive attribute these sounds share is fear. To test comprehension of this common property, four alternative words are given: weary, startled, depressed, and fearful. Note that each of the first three alternatives might be used to describe one of the sounds given. Only the word "fearful" suits all three sounds.

Verbal labels for the classes were used reluctantly. It has already been suggested that over-dependence on semantic labeling was the most serious flaw in earlier attempts at measuring social intelligence. The breadth of the classes (apparent dissimilarity of the class members) in Sound Meaning ruled out the use of behavioral expressions, which are usually quite restrictive and specific in meaning. The higher level of abstraction offered by words was the only practical solution. To reduce the semantic variance introduced by the word-choice task, the alternative words for each item were selected so as to be as different as possible in verbal meaning.

CBR - Cognition of behavioral relations.

Relationships in the other content areas of the SI model refer to meaningful connections between units. This definition was taken to hold for behavioral relationships as well. In addition, the meaning of the term "relationship" in everyday language was used.

One popular meaning refers to a relationship when a social connection exists between two people. In this study, it is assumed that it is the interaction between the members of a diad that connects and relates them. Unless both sides of the diad are "involved," no relationship exists. This view of behavioral relationships, emphasizing as it does the diadic interaction, was the basis for two of the four CBR tests—Social Relations and Silhouette Relations. Two-person relationships are central to much of the conceptualization in the field of social psychology (Foa, 1962). A demonstrable factor CBR might prove to be one of the most useful of the behavioral constructs.

Two other hypotheses about the nature of behavioral relationships were employed. In other SI content areas, analogies and opposites have been used to measure the relations abilities. Analogously, the ideas of behavioral analogies and behavioral opposition led to the development of the tests Cartoon Analogies and Stick Figure Opposites.

Social Relations—Choose the one of three verbal statements that fits the expression of a schematic face, taking into account the feelings expressed by a second face. The research finding (Cline, 1956) that schematic faces, when presented in pairs, were perceived as interacting, suggested that such face-pairs might well be used as stimuli for a behavioral-relations test. Cline's three faces (smiling, glum, and frowning-angry) were redrawn so that their sex would be more ambiguous, and three new faces (wary, surprised, and dejected-sorry) were drawn.

From these six faces, 35 pairs of faces were used to construct a completion form of test called Writing Inner Thoughts. The task is to write what one of the two faces is thinking, taking into account the interaction between them. Writing Inner Thoughts was administered to 50 college sophomores, many of whose responses suggested alternatives for the behavioral-cognition test, Social Relations.

All three verbal statements used as alternatives in the items of Social Relations are suitable accompaniments for the expression of the "target" face. Only one alternative, however, is appropriate if the expression of the second face is also considered. In this way, an item can be answered correctly only if the interaction between the members of the pair is understood.

Silhouette Relations—Choose the one of three photographed faces that expresses the same feeling as that of one member of a diad shown in silhouette (head-and-shoulders) profile. Knapp (1963) had found that different intentions and feelings were attributed to diadic silhouettes depending on the tilt and elevation of each member of the diad with respect to one another. Taking a silhouette profile by itself, its angle relative to its ground is practically meaningless. It connotes little but that the silhouette isn't straight on the page. In combination with another profile, which may be seen as interacting with it, such a positional cue may have social meaning.

Although Knapp has used a variety of silhouette profiles, Silhouette Relations uses only his young-woman-facing-young-man diad. Each item of this test presents the same young man and woman. But since their relative positions are never the same, each item-relationship is different as well.

Comprehension of the silhouette relationships was assessed by means of photographed facial expressions as multiple-choice alternatives. Some of these photographed faces were produced especially for this test; most were adapted from the stimuli used in other photographic tests of behavioral cognition.

Instead of alternating items according to sex, in Part I of Silhouette Relations, the alternative faces were all of men and the task was to choose the face that fitted the man's feelings in the relationship. In Part II of the test, photographs of women were used as alternatives.

The silhouette relationships in this test are very difficult to verbalize; Es have consistently expressed

great uncertainty about their test answers. However, of 240 total test scores, none was so low that it was readily attributable to chance success.

Cartoon Analogies — Choose the one of three alternative expressions that is related to a third given expression in the same way that a second given expression is to the first. Among verbal tests, those having an analogies format are among the best known. Verbal-analogies tests have defined semantic-relations factors in the past (Guilford, et al., 1951). It seems reasonable to expect an analogies test using behavioral stimuli to measure a behavioral-relations ability.

An analogy format presents certain difficulties to the behavioral-test constructor, however. The analogy relation is usually a sophisticated one. The ability to handle such abstractions might easily involve highly developed semantic skills that would overshadow the behavioral components of the task. In addition, most verbal analogies are of the part-whole type or the causal type. In the behavioral realm, a part-whole relationship can all too readily be seen as a similarity relation, a categorization more appropriate to a units or classes test. Causality relationships are difficult to establish with only one expression or cue. Situational or idiosyncratic information must be supplied as well. Therefore, few causality relationships were used in the behavioral-analogies test. Instead, the items in Cartoon Analogies depend mostly on situational or interpersonal relations. For example, in the Cartoon Analogies item given in Appendix A, the given relation might be verbalized as, threatening : protective, an oppositional relationship, but one which also might define an interactive-social situation.

Stick Figure Opposites — Choose the one of three stick figures that expresses a feeling opposite to that of a given stick figure. Sarbin and Hardyck's (1955) research with stick-figure material suggested that such stimuli would be useful in assessing social-cognitive processes. In the present study similar stick figures were used to ascertain whether opposition of expression could be considered a relation. It was thought that such might be the case if the difficulty of the task lay in determining the dimension of intention along which the opposition lay. Seeing a variable is seeing a relation. This conjecture received some support from the fact that a semantic test of opposites, Inventive Opposites, has been loaded on a semantic-relations factor (Guilford & Christensen, 1956).

The construction of Stick Figure Opposites was based on the hypothesis that opposition of units is a relation. The intentional oppositions used in the items of this test are mostly of the "feeling-tone" type (active-passive, open-closed) used in some of the behavioral-classes tests.

CBS - Cognition of behavioral systems.

The systems product has usually been defined as organized, complex, interrelated information. In this study, behavioral systems were conceptualized most often as sequences of social behavior, or stories in which the feelings and intentions of individuals are of paramount importance. It might be mentioned that terms such as sequence and story were chosen because they connote temporal order, events occurring in time. Two of the three behavioral-systems tests used in this analysis, Missing Cartoons and Missing Pictures, were designed to measure this ability to understand unified sequences of intentional behavior.

On the other hand, the element of time need not be a crucial one. A behavioral system might be thought of as a social situation, an episode in which only the interrelatedness of the characters is pertinent. In a situational-system test, the systems variance is contributed not by an increased number of events as would usually occur given the passage of time, but by the complexity of the interrelations of the characters with one another and with their environment. Facial Situations was based on this situational definition of behavioral systems. It was designed, also, to clarify the distinction between the behavioral products of relations and systems — relatedness and interrelatedness.

One of the tests hypothesized to measure the CBC factor, Odd Strip Out, employed classes of systems rather than classes of units. The systems used in Odd Strip Out were sequences of behavior. Over and above this, the systems were classified on the basis of the behavioral consistency or similarity of personality traits manifested by the main cartoon character.

Thus, the perceived personality of an individual is a possible candidate for the SI behavioral-systems category. The interrelatedness necessary for a system can be seen in the exhibition of the same behavior in a variety of situations; the organization essential to a system, in the relatively constant amounts of personality traits possessed. Such a definition of behavioral systems is an exciting one, for it suggests a new, more specific, and more operational definition of personality. Unfortunately, the difficulties in constructing tests of this sort precluded their use in the present analysis.

Missing Cartoons — Choose the one of four alternative cartoons that completes a cartoon strip. In constructing Missing Cartoons, Ferd'nand cartoon strips were chosen that were intentionally, rather than semantically, compelling; that is, the "point" of the strip is primarily dependent on the feelings of the characters involved. Each item consists of a cartoon strip in which one of the four panels has been removed. Understanding of the behavioral system is tested by having E choose the one of four alternative cartoons that will correctly complete a given cartoon strip. For each item, all of the alternatives make semantic sense (see Appendix A), but only one alternative is possible if the feelings of the cartoon characters are taken into account.

To prevent differences in drawing style from being used as a cue in deciding which cartoon correctly completes the strip, the four alternative cartoons for each item were drawn by the same artist. As a further precaution against the presence of semantic cues in the cartoons, punctuation marks such as question marks and exclamation signs were removed.

Missing Pictures — Choose the one of three photographed situations that completes a given pictorial story. The hypothesis underlying Missing Pictures is identical to that on which Missing Cartoons is based. Although the formats of the tests are similar, the stimuli used are different. Missing Pictures is a photographic analog of Missing Cartoons.

The photographs used in Missing Pictures were produced specifically for this test. The photographs depict story situations which were invented before the pictures were taken. For the most part, the actors involved in the photographs were college students without dramatic experience. Most of the items in this test are based on young-adult and school situations. This bias was useful

with Es in the present study, high-school students, but it may limit the acceptability of this measure in other testing situations.

Facial Situations — Choose the one of three verbal descriptions of a situation that fits the expressions on both of two photographed faces. Unlike the other two behavioral-systems tests, the items in Facial Situations deal with episodes rather than sequences. Two photographed facial expressions, one each from the Lightfoot and Frois-Wittman series, are shown. The expressions in the photographs are quite different. E is to choose the one of three verbally described situations that could account for both expressions.

As may be seen in Appendix A, the format of Facial Situations is very similar to that of the behavioral-relations test, Social Relations. An important difference between the tests, however, is that in Social Relations the faces interact, whereas in Facial Situations they do not.

One of the purposes of Facial Situations was to ascertain whether two people in a social situation were sufficient to constitute a behavioral system. Another goal was to determine whether the essence of a relation is interaction; a system not being restricted in this way. Thus, the hypothesis on which Facial Situations is based is that when two people are reacting to a third stimulus (another person or an incident), but not to one another, their reactions to this third stimulus generates a behavioral system. Only when the two individuals are reacting primarily to one another does a simple relationship exist.

CBT - Cognition of behavioral transformations.

A transformation is a change, a redefinition. Several of the SI transformations factors coincide roughly with abilities that might be considered pertinent to creative thinking. A prime example is the factor divergent production of semantic transformations, DMT, also called originality or semantic adaptive flexibility.

A synonym for behavioral transformation might be behavioral flexibility. Flexibility in dealing with social stimuli would certainly seem crucial in "coping" or "adjusting." That is to say, inability to "ride with the punches," to change sets, might be a large component in neuroticism or emotional disturbance. If this is the case, the ultimate usefulness of measures of factor CBT, the ability to redefine intentional behavior, is an intriguing prospect.

In some other content areas of the SI model, the isolation of transformation abilities has been particularly difficult (Nihira, et al., 1964). To favor the emergence of factor CBT in this analysis, five tests were constructed, each hypothesized to measure it. These tests include measures of the ability to recognize a transformation in a behavioral system (Cartoon Exchange, Picture Exchange), to redefine the dispositional meaning of gestures and postures (Expression Exchange), to comprehend more than one behavioral meaning in a verbal phrase (Social Translations), and to grasp the humor in captioned baby pictures (Who Said It?).

Cartoon Exchange — Choose the one of four alternative cartoons which when substituted for a designated panel of a cartoon strip changes the meaning of the whole story. Cartoon Exchange is one of the two transformations tests in which behavioral systems are redefined. Each item presents a complete four-panel cartoon strip. These cartoon strips were chosen for the emphasis they place on intentional or motivated behavior. Further, the meaning or story depicted in the strip could be transformed by changing one of the four panels in the strip. In this way, the meaning of the whole system could be transformed by a change in one part of the system.

Inspection of a sample item from Cartoon Exchange will illustrate this kind of transformation. In the item given in Appendix A, the cartoon strip in the top row shows Ferd'nand noticing a pretty girl and using his hoop as a means of getting to know her. E's task is to change the story by substituting one of the cartoons in the second row for the cartoon indicated by the arrow. Alternative cartoons 1, 3, and 4 could be substituted for the arrowed cartoon with no change in Ferd'nand's motivation. Alternative 2, however, would effect such a transformation. Ferd'nand noticed a friend of his on the sand, so he went down to talk to her. The point of the story is different; it has been redefined.

Cartoon Exchange is like the systems test Missing Cartoons in at least two respects. Both tests use the same kind of stimuli, Ferd'nand cartoon strips, and even more important, both tests employ behavioral systems. In Missing Cartoons, the systems variance is essential; in Cartoon Exchange, it is a necessary evil. E must comprehend the given system before he can attempt to cognize its transformation. For these reasons, a substantial correlation between the two tests would not be surprising.

Picture Exchange — Choose the one of three alternative photographs which, when substituted for one picture of a four-picture story, will change its meaning. Just as Missing Pictures is a photographed version of Missing Cartoons, Picture Exchange is a pictorial analog of Cartoon Exchange. Instead of cartoon strips, series of photographs are used to tell stories whose plots are based on the intentions and feelings of the actors pictured. As in Cartoon Exchange, E is to demonstrate his ability to cognize a transformation of a behavioral system by choosing a substitute for one of the pictures in the original story sequence.

The photographs used in Picture Exchange were produced especially for this test; the actors included college students, children, and mature adults. The stories in Picture Exchange were less dependent on school settings than those of Missing Pictures, and so might be useful in a greater variety of testing situations.

Expression Exchange — Choose the one of three sketched facial expressions that changes the meaning of a given gesture. The same gesture or posture can often be used to convey different behavioral messages. Expression Exchange was an attempt to measure the ability to cognize transformations in intentional expressions or units.

Each item of this test presents a drawing of a gesture or posture accompanied by a particular facial expression. This facial expression specifies the behavioral meaning of the given gesture. E is to choose an alternative facial expression that not only fits the given gesture, but also changes or transforms its meaning. For example, in the sample item in Appendix A, the gesture "hands-on-hips" can be used to express anger, but it may also convey provocativeness or "come-hitherness."

Social Translations — Choose the one of three alternative pairs of people between whom a given verbal

statement will have a different intentional meaning. The setting in which a social statement is made can affect it greatly. Suppose a parent says "I don't think so" to a child. In most parent-child relationships, this is an unemotional statement of opinion. The child's disagreement implies little loss of status to the parent. Should a student say "I don't think so" to his teacher, however, this same statement might signify a challenging, emotional attitude. Blatant disagreement with one's teacher is not a conventional mode of expression, particularly if personalized (I don't think so, rather than Mr. Authority doesn't agree with you).

The recognition that different relationships can transform the meaning of a verbal statement is hypothesized to be one kind of behavioral transformation. Social Translations was constructed as a measure of this ability.

Who Said It?—Choose the one of four photographed baby's expressions that fits a given caption. Humor is an area of psychological interest about which little is known. In this study, it was speculated that some of the cognitive components of humor might lie in the behavioral realm.

A type of humor that readily suggested itself as appropriate for the behavioral domain is that used in "baby books" (Bannister, 1950; 1952). Pictures of infants when paired with captions more appropriate for adults are considered funny by almost everyone. The extraordinary expressions on the babies' faces seemed well suited for use in a test of behavioral intelligence.

Appreciation of this kind of humor was hypothesized to be evidence of the CBT ability. It was thought that the humor lay in grasping the disparity between the infant's actual capabilities and the potentialities credited to him by the caption accompanying his picture. In effect, the caption transforms the infant into an adult, and to this incongruity one responds with laughter.

Not only is the correct baby-picture alternative the one that is funny; it is the one that fits the caption best. Captions were written especially for this test. E's particular brand of sense of humor need not necessarily penalize him in responding to the items of Who Said It?. The test is easier if the humor of the items is appreciated, but other strategies may be used in answering them.

CBI - Cognition of behavioral implications.

It has been thought that the SI product category of implications is concerned with extrapolations from given information to either its antecedents or its consequents. Of the three tests written to measure the hypothesized CBI factor, one, Cartoon Implications, was based on both the antecedents and consequents components of the implications definition; a second, Cartoon Predictions, only on the consequents part of the definition; and a third, Reflections, on the definition of cognition of implications as a sensitivity-to-problems ability.

Cartoon Implications—Choose the one of four verbal statements that describes what precedes, or will follow a cartoon situation. In Cartoon Implications, each item presents a single Ferd'nand cartoon. E is to choose the one of four verbal statements that describes either what led up to the situation shown, or what will happen afterwards. Cartoon Implications was designed to measure implications, broadly conceived to include both antecedents and consequents.

Cartoon Predictions—Choose the one of three alternative cartoons that shows what will follow from a given cartoon situation. In dealing with other people, the ability to make predictions about their behavior is a valuable asset. The importance of this ability may be gauged by the research interest it has evoked. Some researchers (Cline & Richards, 1960) have narrowed their definition of social intelligence so that it includes only this ability to make accurate behavioral predictions.

In Cartoon Predictions, E is to make predictions based on the behavioral information included in a cartoon. The items in Cartoon Predictions employ an original cartoon character, named Barney. The predictions made are stereotypic in that the correct response is the one that would usually happen next. Attempts were made to delineate idiosyncratic personalities about which predictions were to be made—a situation more like that in real life. However, much information is needed before any but obvious predictions can be made about an individual. Such personality descriptions were rejected as too uneconomical for use as factor-test stimuli.

Reflections—Choose the one of three alternative interpretations that correctly reflects the feeling of a tape-recorded statement. The factor CMI, cognition of semantic implications, was originally interpreted as one of conceptual foresight (Berger, et al., 1957), while the parallel factor, EMI, evaluation of semantic implications, was defined as sensitivity to problems (Kettner, et al., 1959; Guilford, et al., 1961; Merrifield, et al., 1962). However, in a recent semantic-evaluation study (Nihira, et al., 1964), tests that had previously defined these two factors were loaded together on the same factor. Since another dimension isolated in the factor analysis seemed more appropriately designated as factor EMI, the label CMI was given to the factor on which measures of both conceptual foresight and sensitivity to problems were loaded. The definition of CMI was thus broadened to include both foresight and sensitivity to problems. It seemed reasonable to expect that both behavioral foresight and behavioral sensitivity to problems might belong to CBI.

The hypothesis of CBI as behavioral foresight or predictions has been covered in two tests already discussed, Cartoon Implications and Cartoon Predictions. As a measure of the sensitivity-to-problems definition of implications, a test of sensitivity to verbal communications was devised.

Of all those who are interested in the feelings underlying verbal statements, nondirective therapists are perhaps most concerned with sensitivity to the "real" intentional or emotional meaning. The Rogerian technique of "reflecting" feeling demands this sensitivity. The test Reflections was based on this conception of reflection of feeling as one kind of behavioral sensitivity. In constructing the test, statements were selected from published reports of therapy cases. Alternative "reflections of feeling" were chosen, with the keyed response being, in many cases, a reflection which the original therapist had noted to be a good one (Porter, 1950; Porter & Streich, 1963; Rogers, 1942; Snyder, 1947).

Pretesting results indicated that the test was too difficult for most Es, so a tape recording of the given statements was made to reduce their ambiguity. A group of non-actors, varied with respect to age, sex, and occupational level, read the statements with the appropriate inflections. In addition, the alternative

reflections-of-feeling responses were read so as to reduce reading-comprehension variance.

This report has tended to depreciate the importance of verbal cues in understanding emotional behavior, an orientation prompted mainly by the results of previous research in which over-reliance on verbal presentation tended to obscure the existence of any but semantic abilities. However, it is probable that the psychotherapist and others concerned with person cognition do use verbal-behavioral cues as often as nonverbal ones.

SELECTION OF REFERENCE FACTORS

In choosing the intellectual factors from which to distinguish the hypothesized behavioral-cognition dimensions, two general strategies were used. The most compelling one was to hypothesize, in broad psychological terms, what non-behavioral abilities might be assessed by the experimental tests. For example, though efforts were made to control for this by proper test construction, E's verbalization or semantic labeling of nonverbal stimuli might aid in choosing the correct answer. This labeling ability might, in fact, be the major ability measured by the behavioral tests. To determine whether this were the case, measures of Adkins' (Adkins & Lyerly, 1951) concept-naming factor (convergent production of semantic units or NMU) were included in the test battery.

Another hypothesis was that the behavioral tests present the examinee with exercises in problem solving (Moore, 1958). As a check on this possibility, measures of the general-reasoning factor (CMS), an important aspect of problem solving, were employed.

Related to this problem-solving conjecture was the idea that the unusual nature of the behavioral tests might require some accommodation, and this characteristic of the tests might favor more flexible individuals. For this reason, measures of "creative thinking" were employed as indirect indicators of E's willingness to accept, and ability to respond to unusual situations. The factors thought to be related to this possible tendency were ideational fluency (DMU) and originality (DMT). Weisgerber (1956) reported that accuracy in judging emotional expressions is related to semantic expressiveness and verbal fluency. The inclusion of measures of these "creative" abilities in the final test battery was intended to permit replication of his findings.

Many of the behavioral-cognition tests use Ferd'nand or other cartoon stimuli. Cartoon material is not necessarily behavioral material, however. Only if the cartoon includes dispositions such as emotions or intentions should it be considered a potential behavioral stimulus. If behavioral information is not depicted, cartoons may be used to assess semantic abilities. For example, a test based on the Louie cartoon strip has been used (Adkins & Lyerly, 1951) to define a semantic-ordering (NMS) factor. This test, called Picture Arrangement, was included in the present study to determine whether the behavioral tests, particularly those using cartoons, were possibly nothing but measures of cartoon or format "factors."

Since most of the behavioral tests use visual stimuli of one kind or another, it seemed desirable to ascertain whether any visual-figural abilities are involved in responding to them. Marker tests of speed of closure (CFU), figural inductive reasoning (CFR), and flexibility of closure (NFT) were used to determine this. The NFT factor was included for another reason as well. Messick and Damarin (1963) had found that persons with high scores on an embedded-figures test, similar to Hidden Figures, an NFT marker test, were superior at recall of social stimuli, faces. It was thought desirable to ascertain whether this superiority exists in the area of cognition as well as that of memory.

The second method of selecting reference factors was dictated by the more specific needs of structure-of-intellect factor definition. If one wishes to show that six behavioral-cognition factors are factorially independent of other structure-of-intellect factors, a convincing demonstration of this independence would be to separate these dimensions from all relevant factors having two of the three structure-of-intellect parameters in common with them. In this study, the differentiation of behavioral-cognition factors from semantic-cognition factors seemed probably most needed. On this basis, marker tests for the reference factors of CMU, verbal comprehension; CMC, verbal classification; CMR, verbal relations; and CMI, conceptual foresight or sensitivity to problems, were administered to all examinees.

The marker tests selected for inclusion in the final test battery were chosen because each had defined a reference factor in the past and because each could be administered in a relatively short time. In an attempt to conserve testing time, three tests were employed that Es had already taken as part of their school's testing program. For example, a few months before this study's testing, Es had taken the Henmon-Nelson Tests of Mental Ability (Lamke & Nelson, 1957). To avoid the necessity of using a second CMU (verbal-comprehension) test in the final test battery, the 20 vocabulary items of the Henmon-Nelson test were scored. In addition, as a second measure of the general-reasoning factor, CMS, the Quantitative Thinking test in the Iowa Educational Development Series (Lindquist & Bloomers, 1960) was used; and as an alternative CFR test, existing DAT Abstract Reasoning (Bennett, Seashore, & Wesman, 1959) scores were used. Es had taken the DAT nearly two years prior to the present study's testing.

The Marker Tests

CMU - Cognition of semantic units: verbal comprehension; knowledge of the meaning of words.

Verbal Comprehension—Choose the one of five alternative words that has the same meaning as a given word.

Henmon-Nelson Vocabulary—Choose the alternative word that has the same meaning as a given word. Choose the alternative word that correctly completes a given sentence.

CMC - Cognition of semantic classes: conceptual classification; comprehension of the attribute common to the members of a class.

Verbal Classification—Decide whether each of a group of words belongs with one of two classes, or with neither.

Word Classification—Choose the one of four words that does not belong with the other three.

CMR - Cognition of semantic relations: understanding the relationships that may hold among word meanings.

Verbal Analogies I—Choose the one of four words that completes a given analogy.

Word Matrix Test—Choose the one of five words that completes a 2 x 3 matrix of words.

CMS - Cognition of semantic systems: general reasoning; comprehension of complex, meaningful material.

Iowa Tests of Educational Development - Quantitative Thinking—Solve a variety of mathematical problems.

Ship Destination Test—Find the distance of a ship to a port, taking into account an increasing number of variables.

CMI - Cognition of semantic implications: conceptual foresight; sensitivity to problems.

Pertinent Questions—Write four questions that could be asked in making a decision about a given situation.

Seeing Problems—Write five problems connected with the use or function of a common object.

NMU - Convergent production of semantic units: concept naming.

Picture-Group Naming—Write the class name for five pictured objects.

Seeing Trends I—Specify the meaningful trend in a group of words.

NMS - Convergent production of semantic systems: semantic ordering.

Picture Arrangement—Reorder a cartoon strip so that it makes temporal sense.

Sentence Order—Arrange three sentences in a meaningful order.

DMU - Divergent production of semantic units: ideational fluency.

Consequences - obvious—Write many different results of an unusual situation; only common or obvious outcomes are credited.

Plot Titles - low quality—Write many different titles for a short story; only relevant, but unclever responses are credited.

DMT - Divergent production of semantic transformations: originality.

Consequences - remote—Write many different results of an unusual situation; only indirect or uncommon results are credited.

Plot Titles - high quality—Write many different titles for a short story; only clever titles are credited.

CFU - Cognition of figural units: speed of closure.

Mutilated Words—Identify words in which parts of each letter are missing.

Street Gestalt Completion—Identify pictured objects having missing parts.

CFR - Cognition of figural relations: comprehension of relationships among concrete objects, such as quasi-geometric figures.

Differential Aptitude Test - Abstract Reasoning—Choose the one of five alternative figures that completes a four-figure series.

Figure Matrix Test—Choose the one of five alternative figures that completes a 3 x 3 matrix of figures.

NFT - Convergent production of figural transformations: figural redefinition.

Hidden Figures—Choose the one of five alternative figures that is hidden in a given figure.

Penetration of Camouflage—Find the human faces camouflaged in the lines of a realistic drawing.

PROCEDURES

The Tested Sample

Because of the possible culturally specific nature of many of the test stimuli, particular care was exercised in choosing a group of Es. It is possible that the social environment of Negroes, Orientals, or other minority groups might unduly handicap their performance on the tests. On no account should this be interpreted to mean that such groups are inferior in social intelligence. It implies only the need for a control for a perhaps relevant variable. Their exclusion as Es was a precaution based on what was presumed to be limited experience with gestures or facial expressions more common to the white, middle-class culture.

Other restrictions on the choice of the sample were that its members have at least average intelligence on traditional IQ tests so as to be able to follow test instructions, and that they be old enough to recognize the social situations presented in some of the behavioral tests.

The sample selected for this study included 306 eleventh-grade students at Pasadena High School in Pasadena, California, a middle-class, chiefly Caucasian community.[6] At the request of school officials, 52 gifted students were included in the sample. Complete factor-analytic test information was obtained on the performance of 110 boys and 130 girls. The mean age of the final group of 240 was 16.7 years. The average Henmon-Nelson IQ of 229 of these examinees was 117.7 with a standard deviation of 16.9 and a range from 83 to 155.

From a subsample of 236 Es it was learned that half of these students came from homes of superior socioeconomic standing. On the Occupational Scale of Hollingshead's Index of Social Position (Hollingshead & Redlich, 1958), 135 students received ratings of 1 or 2 (see Appendix A).

Test Administration

The factor tests were administered to ten classes of approximately 30 students each on March 10, 12, 18, and 19, 1964. Four testers administered the tests during the usual social-studies period, a double-length period of 111 minutes. The administrators were rotated so that each class had a different administrator for each day's testing.[7] The tests were administered in the same order to all Es. The superior nature of the students, the small, familiar groups in which testing occurred, and the enjoyable nature of many of the tests made for excellent testing conditions.

---

[6] We are very much indebted to Dr. Marcella Bonsall, Dr. Joseph Hansen, and Mr. Alan Dittberner for their help in arranging the testing at Pasadena High School.

[7] Dr. Ralph Hoepfner made invaluable contributions to the test administration as well as to the preparation of this report.

Table 2

Means, Standard Deviations, Distributions, Scalings, and Reliabilities of Scores

Test Name and Code[a]	Mean	Standard deviation	Form of distribution[b]	Scaling[c]	Reliabilities[d] K	S-B	h^2
1. Cartoon Analogies CBR03A	13.5	2.7	N		.45	.25	
2. Cartoon Exchange CBT01A	14.6	5.0	P	C	.84	.81	
3. Cartoon Implications CBI01A	28.2	3.9	N-		.75	.71	
4. Cartoon Predictions CBI03A	22.6	3.9	N-		.79	.70	
5. Consequences - obvious (DMU)	22.7	6.6	P	C		.77	
6. Consequences - remote DMT03B	4.5	3.2	T+	S		.60	
7. DAT Abstract Reasoning (CFR)	79.5	21.0	T-	D			.94
8. Expressions CBU01A	24.1	3.6	N		.64	.57	
9. Expression Exchange CBT04A	16.1	5.5	P	C	.83	.81	
10. Expression Grouping CBC04A	20.2	3.1	N		.62	.58	
11. Faces CBU02A	18.9	2.4	N		.37	.39	
12. Facial Situations CBS03A	16.1	2.2	N-		.31	.24	
13. Figure Matrix Test CFR02A	4.2	1.4	N		.43		
14. Henmon-Nelson Vocabulary (CMU)	13.1	3.4	N		.84		
15. Hidden Figures NFT04A	8.7	3.1	N		.72		
16. Inflections CBU04A	20.8	2.4	N		.26	.26	
17. ITED Quantitative Thinking (CMS)	79.9	21.5	T-	D			.86
18. Missing Cartoons CBS01A	21.9	3.9	N-		.77	.75	
19. Missing Pictures CBS04A	14.6	2.7	N		.53	.48	
20. Mutilated Words CFU03A	11.9	3.4	N				.45
21. Odd Strip Out CBC02A	12.8	2.4	N-		.60	.53	
22. Penetration of Camouflage NFT02A	6.8	2.5	N				.44
23. Pertinent Questions CMI02B	11.7	2.5	N-				.56
24. Picture Arrangement NMS02B	6.8	2.5	T-	D	.21		
25. Picture Exchange CBT03A	11.0	2.6	N		.43	.38	
26. Picture Exclusion CBC05A	13.3	2.5	N		.34	.35	
27. Picture-Group Naming NMU03A	5.2	1.5	L		.39		
28. Plot Titles - low quality DMU05A	7.3	4.4	N++	C		.53	
29. Plot Titles - high quality DMT01E	6.4	3.5	N++	C		.62	
30. Questions II CBU03A	22.8	3.1	N		.50	.52	
31. Reflections CBI04A	10.9	2.6	N		.43	.45	
32. Seeing Problems CMI03A	12.1	3.3	N				.53
33. Seeing Trends I NMU01A	4.6	2.6	N		.77		
34. Sentence Order NMS03B	6.2	1.6	N		.43		
35. Ship Destination Test CMS02B	23.9	9.3	P	C			.52
36. Silhouette Relations CBR05A	14.1	2.9	N		.45	.35	
37. Social Relations CBR02A	13.4	2.2	N		.29	.20	
38. Social Translations CBT02A	17.5	4.5	N-		.86	.84	
39. Sound Meaning CBC06A	23.4	2.0	N		.36	.29	
40. Stick Figure Opposites CBR04A	17.7	3.6	N		.65	.62	
41. Street Gestalt Completion CFU05A	11.5	2.6	N				.41
42. Verbal Analogies I CMR01B	8.9	2.0	N-		.50		
43. Verbal Classification CMC02B	28.4	7.2	P	C			.70
44. Verbal Comprehension CMU02C	14.1	3.3	N		.78		
45. Who Said It? CBT05A	13.2	2.2	N		.25	.21	
46. Word Classification CMC01A	11.6	2.0	N		.38		
47. Word Matrix Test CMR02A	6.6	1.9	N		.53		
48. Sex	.5	.5					
49. Sibling Status	.5	.5					
50. Socio-Economic Status	2.5	1.5	T+	D			
51. Mental Age (Henmon-Nelson)	22.3	4.1	T-				
52. Chronological Age	16.7	.4	N				

[a] In the code designation of tests, the first three letters refer to the hypothesized factor content of the test. Letters in parentheses represent the hypothesized factor content of tests without code numbers.

[b] The code for distribution forms is the following: N, normal; P, platykurtic; L, leptokurtic; T, truncated; -, slight negative skew; +, slight positive skew; ++, strong positive skew.

[c] The code for scaling of scores is the following: C, C-scaled; S, stanine-scaled; D, dichotomized at the median.

[d] The code for reliability estimates is the following: K, general Kuder-Richardson formula; S-B, Spearman-Brown estimate of whole-test reliability from inter-part correlations; h^2, communality as a lower-bound estimate of reliability.

Scoring

Frequency distributions of responses to each item of the multiple-choice tests were inspected for agreement with the rational key.[8] If an item-response distribution was bimodal or platykurtic, the item was eliminated in the initial scoring of the test. For each test, dichotomization of the initial test scores at the median identified high and low scorers, who served as the criterion groups used in item analysis. Only items capable of yielding positive phis were retained in the final scoring. For a few tests, this item-analysis procedure was repeated several times.

In responding to the behavioral tests, an E often cannot verbalize or explain why he chose a particular answer. For this reason, some random guessing was suspected. Inspection of examinee-response patterns did not support this belief, but as a safeguard, a correction-for-guessing formula was applied where appropriate. In most cases, the formula, rights plus omits divided by the number of alternatives, was used.

For each test, the total test score is the sum of the part scores, separately corrected for guessing. The exact scoring formula used for each test is given in Appendix A.

Although most of the tests used in this study are objectively scored, fourteen of them required scoring with varying degrees of subjectivity. Tests 20, 22, 24, 34, and 43 (see Table 2) are written-response rather than answer-sheet tests. However, their scoring is quite objective, so they were scored and checkscored by clerical workers. Tests 27, 33, and 41 were scored and checkscored by clerical workers and then re-checkscored by the senior author.

Of the tests used in this study, Pertinent Questions, Seeing Problems, Plot Titles, and Consequences are the most difficult and least objective to score. These tests were first scored by an experienced, creativity-test scorer, and then checkscored by the first author. The inter-scorer reliabilities for these four tests were, respectively, .97, .91, .94, and .83. Since the inter-scorer reliability for Consequences was relatively low, a list was made of all responses on which the two scorers disagreed. The disagreements were then arbitrated by a third scorer, highly experienced in scoring Consequences.

In this analysis, as in others, measures of the factors DMU and DMT were obtained by scoring each of two tests, Consequences and Plot Titles, for two kinds of responses. The remote or clever answers were scored as measures of originality (DMT); all other relevant, non-duplicate responses were scored for ideational fluency (DMU).

Originally, an attempt had been made to reduce the experimental dependence in this procedure. Only the relevant responses of one part of each test were to be scored as measures of DMU; and only the remote or clever ones in the remaining part or parts, as measures of DMT. In addition, since it had been indicated (Christensen, et al., 1957) that instructions to be clever increase the number of clever or remote responses, one part of Plot Titles was given with directions to write "appropriate" titles, the other, with instructions to write "clever" ones. When all the relevant responses for the "appropriate" part of Plot Titles were scored as a measure of DMU, however, this score correlated .49 with the other part of Plot Titles, scored for DMT and given under a "clever" instructional set. Some correlation was expected. The relevant responses included remote and clever ones as well. A correlation coefficient of this size, however, is about what holds between different parts scored for only one factor. Since this scoring procedure reduced the variance available for both factors, and since no difference in mean cleverness was observed as a function of different instructional sets, both parts of Plot Titles were scored for both factors in the traditional manner.

Ideational fluency is often thought to be synonymous with quantity of output, quality of product not being considered. This is not true. As usually scored, the "left-over," low-quality nature of DMU cannot be stressed sufficiently. Under present scoring procedures, an E with 20 clever responses will have a lower DMU score than an E with five mediocre ones. Conceptually, DMU and DMT are independent. Operationally, this independence is forced by the way in which these two DMU-DMT tests are scored. The factors DMU and DMT, if defined only by these tests, must be cautiously interpreted in the light of the scoring procedures used.

Statistical Analysis

The total-score distribution of each variable was checked for normality of distribution. If the data were other than normally distributed, an appropriate scaling technique was applied. The variables treated in this manner are indicated in Table 2.

Means and standard deviations were obtained for all part and for all total test scores. The only scores available for the DAT Abstract Reasoning and the ITED Quantitative Thinking were nationally-normed percentiles. However, for intra-table consistency, the means and standard deviations of these variables are reported in Table 2.

Where justifiable, both a Spearman-Brown estimate of whole-test reliability and an estimate of internal consistency were determined for each test. If a test was speeded or had only one part, its communality was used as a lower-bound approximation to its reliability.

The estimates obtained indicate that most of the tests in this battery are at least moderately reliable. Among the behavioral tests, two with particularly low reliabilities are auditory in nature. These tests, Inflections and Sound Meaning, were deliberately made easy. Previous research (Eisenberg & Zalowitz, 1938; Fay & Middleton, 1942; Kramer, 1963) has indicated that there is little agreement among subjects when auditory stimuli alone are used to convey emotion. However, in this study, Es agreed too readily with the key, and consequently item variance was unduly constricted.

In correlating the total scores of all variables, the coefficients were based on the actual number of cases

---

[8] The computations used in this study were performed using the Honeywell 800 at the Computer Sciences Laboratory of the University of Southern California, and the IBM 7094 at Western Data Processing Center, Graduate School of Business Administration, University of California at Los Angeles. We are indebted to Dr. Kazuo Nihira for his help with the computer programs used in this analysis.

for each variable. Although the majority of the coefficients were based on the whole sample of 240, scores for variables 7, 14, 17, 49, 50, 51, and 52 were available only on subsamples of 194, 229, 231, 238, 236, 229, and 238, respectively. This used all the available information, assuming comparability of subjects with respect to correlations.

The computer program used to determine the correlation coefficients yields Pearson product-moment r's for normally distributed data. Correlations between dichotomized and undichotomized variables would be point-biserial r's; and between two dichotomized variables, phis would result. In order not to mix correlation coefficients in a matrix to be factor analyzed (Guilford, 1952; Carroll, 1961), the correlations of the dichotomous variables with the other variables to be factor analyzed were corrected so as to approximate Pearson r's. This corrected-correlation matrix is given in Table 3.

The correlations holding among the first 47 variables, the variables to be factor analyzed, are what might be expected of an aptitude-correlation matrix. With the exception of variable 28, few negatives exist. The large number of small and zero correlations is promising in light of the use of the simple-structure criterion.

Of the correlations between sex and the other variables significant at the .01 level, about half are in one direction and half in the other. The boys in this sample did significantly better on variables 6, 17, 29, and 33, all semantic tests. Since most of the gifted students were boys, their superiority at verbal tasks is not surprising. Although girls did better than boys on one semantic variable, test 5, the rest of the significant negative correlations are with behavioral variables, tests 1, 11, 26, 37, and 38. This female superiority at behavioral tasks supports other research findings (Bronfenbrenner, et al., 1958; Buzby, 1924; Jenmess, 1932). However, although these correlations are significant, the largest of them is -.17, which indicates only minimal relatedness.

Sibling status had only two significant correlations, both with semantic variables, tests 6 and 32. The indication that only and oldest children do better at semantic tests is probably another effect due to gifted-student confounding, since most of the gifted students in this sample were only children. The striking lack of only-oldest superiority in behavioral tasks is in contrast to most findings in this area (Sears, 1950; Schacter, 1959).

Table 3

Correlation Matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Cartoon Analogies		21	35	26	08	-01	28	28	21	34	15	21	00	18	14	25	12	29	21	10	30
2. Cartoon Exchange	21		32	29	02	16	48	33	25	28	09	22	30	38	32	18	53	45	29	17	40
3. Cartoon Implications	35	32		40	08	15	44	42	28	47	22	29	24	47	30	32	42	61	41	23	51
4. Cartoon Predictions	26	29	40		13	07	30	32	16	35	07	25	26	31	26	19	37	45	32	20	38
5. Consequences - obvious	08	02	08	13		00	07	12	03	08	08	19	05	07	10	11	10	06	07	03	09
6. Consequences - remote	-01	16	15	07	00		07	11	08	16	04	-02	-01	19	07	04	24	07	06	02	05
7. DAT Abstract Reasoning	28	48	44	30	07	07		34	24	28	-01	16	32	43	55	18	48	07	14	23	40
8. Expressions	28	33	42	32	12	11	34		21	51	23	20	25	32	21	33	33	49	32	17	43
9. Expression Exchange	21	25	28	16	03	08	24	21		27	07	05	10	34	17	19	23	28	25	06	31
10. Expression Grouping	34	28	47	35	08	16	28	51	27		24	31	26	27	20	36	29	40	37	19	38
11. Faces	15	09	22	07	08	04	-01	23	07	24		19	16	04	01	21	11	24	18	-01	18
12. Facial Situations	21	22	29	25	19	-02	16	20	05	31	19		13	15	11	23	11	20	26	11	24
13. Figure Matrix Test	00	30	24	26	05	-01	32	25	10	26	16	13		31	35	08	44	30	21	12	30
14. Henmon-Nelson Vocabulary	18	38	47	31	07	19	43	32	34	27	04	15	31		36	25	58	41	29	23	43
15. Hidden Figures	14	32	30	26	10	07	55	21	17	20	01	11	35	36		14	47	32	22	32	31
16. Inflections	25	18	32	19	11	04	18	33	19	36	21	23	08	25	14		22	37	30	22	30
17. ITED Quantitative Thinking	12	53	42	37	10	24	48	33	23	29	11	11	44	58	47	22		46	26	23	40
18. Missing Cartoons	29	45	61	45	06	07	47	49	28	40	24	20	30	41	32	37	46		40	22	60
19. Missing Pictures	21	29	41	32	07	06	14	32	25	37	18	26	21	29	22	30	26	40		19	48
20. Mutilated Words	10	17	23	20	03	02	23	17	06	19	-01	11	12	23	32	22	23	22	19		23
21. Odd Strip Out	30	40	51	38	09	05	40	43	31	38	18	24	30	43	31	30	40	60	48	23	
22. Penetration of Camouflage	17	25	28	20	08	17	24	23	07	23	-03	11	25	32	27	18	39	29	16	29	22
23. Pertinent Questions	17	34	28	24	29	38	28	21	19	28	14	16	15	28	28	19	44	26	21	12	24
24. Picture Arrangement	16	17	30	19	14	14	22	21	26	21	-05	00	25	27	18	18	35	37	19	04	25
25. Picture Exchange	24	37	41	40	00	11	32	35	29	40	14	15	30	39	29	26	43	42	31	19	41
26. Picture Exclusion	25	22	19	16	08	05	27	22	15	29	06	10	05	20	14	15	10	18	09	11	21
27. Picture-Group Naming	04	25	32	26	05	26	28	12	15	23	05	06	16	37	21	14	26	24	22	22	28
28. Plot Titles - low quality	-01	-06	-12	00	26	09	-13	-09	-12	-02	-01	-08	08	-06	-06	-13	03	-17	-06	-04	-08
29. Plot Titles - high quality	01	24	24	17	15	42	20	29	18	35	07	14	13	36	19	13	28	27	15	13	24
30. Questions II	21	30	40	18	08	-03	28	18	20	21	14	20	14	30	21	25	34	35	25	15	31
31. Reflections	17	32	26	30	06	10	29	33	32	36	09	19	26	40	19	18	37	33	26	08	35
32. Seeing Problems	17	13	24	15	29	29	15	20	13	26	16	13	02	28	15	20	25	18	16	03	15
33. Seeing Trends I	01	25	14	12	08	07	35	16	11	14	11	09	18	31	33	17	38	27	02	25	17
34. Sentence Order	23	29	33	18	-02	04	25	18	26	18	11	09	14	44	24	18	37	29	27	17	30
35. Ship Destination Test	17	34	35	30	14	10	49	25	23	20	12	10	31	40	43	17	59	36	25	27	31
36. Silhouette Relations	13	14	23	17	07	-02	18	16	15	33	09	21	09	16	13	12	20	25	18	01	20
37. Social Relations	21	17	20	23	-04	01	15	11	18	15	14	12	13	21	09	09	23	11	16	08	14
38. Social Translations	22	31	31	20	11	12	40	34	36	22	18	15	14	39	24	20	33	33	34	06	41
39. Sound Meaning	22	23	29	17	-02	13	26	26	26	24	14	12	24	34	15	14	32	26	22	06	26
40. Stick Figure Opposites	20	19	27	15	00	07	17	29	18	28	20	14	15	28	16	16	30	29	21	15	32
41. Street Gestalt Completion	15	11	28	28	07	14	23	26	12	23	-02	17	08	25	23	23	16	33	17	28	23
42. Verbal Analogies I	17	35	36	20	-06	15	41	28	24	30	10	16	32	50	33	18	47	34	29	20	42
43. Verbal Classification	20	30	36	31	04	11	48	26	23	29	15	10	27	53	38	32	53	41	27	28	33
44. Verbal Comprehension	15	40	41	26	02	18	39	40	28	30	08	20	29	78	31	27	56	43	23	24	39
45. Who Said It?	07	13	19	17	07	04	18	12	15	12	02	13	09	17	07	19	15	11	08	17	12
46. Word Classification	14	34	37	24	10	07	48	35	17	32	14	19	23	48	28	22	41	34	27	11	30
47. Word Matrix Test	15	37	35	31	01	16	51	39	28	36	11	19	27	48	30	23	61	41	24	13	34
48. Sex	-17	07	-03	01	-21	12	-01	01	-08	-03	-17	-12	06	-02	04	-03	24	01	-07	04	-09
49. Sibling Status	02	-04	00	00	-03	-18	00	-04	-03	02	02	00	04	-03	04	08	-11	06	02	-06	06
50. Socio-economic Status	-08	-18	-08	-14	05	-10	-15	-19	-04	-13	-03	-05	-10	-21	-11	-01	-12	-16	-03	03	-11
51. Mental Age (Henmon-Nelson)	20	45	46	35	09	20	38	33	32	32	09	15	32	83	43	24	59	44	29	26	41
52. Chronological Age	-20	-13	-17	-19	-04	-04	-18	-06	-09	-08	-11	-10	-11	-24	-15	-14	-18	-17	-05	-16	-08

Note. —Decimal points omitted.

All of the significant correlations with socio-economic status are negative in sign, indicating that Es of higher socio-economic standing performed better. Of the 22 significant correlations, ten are with semantic variables and 12 with behavioral ones. Again, this could be due to the gifted students in the sample.

The substantial correlations of many variables with the complex mental-age estimate from the Henmon-Nelson test (variable 51) is to be expected. The correlations with chronological age indicate a general superiority of the younger Es. This need not mean that social intelligence decreases with age. The correlations seem better explained in terms of the age of the gifted students, who, as a group, were below age for their grade placement.

The Factor Analysis

The correlation matrix of the first 47 variables in Table 3, with the highest correlation in each column entered in the diagonal, was submitted to an iterated-communality program. Communalities tended to stabilize after six iteration cycles, so these communality estimates were employed in the extraction process. The iterated-communality estimates were then inserted into the diagonal of the correlation matrix, and 33 principal factors were extracted using the BIMD 17 program. The first 22 principal factors extracted were retained since they accounted for 95.7 percent of the variance and a plot of the eigenvalues of all factors extracted showed a dip after the 21st one.

A varimax rotation of these 22 factors yielded three large factors. The largest one had loadings only of semantic tests, the next largest, mainly of behavioral tests, and the third, only of figural markers. The remaining factors were uninterpretable doublets. This is a typical varimax solution and one not suited to an examination of the hypotheses of this study. Patterned equamax rotations of 22 factors in one case, and of 18 (the hypothesized number) in another, were also tried. These solutions yielded uninterpretable factors with little positive manifold and no simple structure. Since all factors were not equally represented in the test battery, such a finding was not unexpected.

The 22 principal factors were then submitted to an orthogonal rotation program designed to maximize the similarity of the empirical factor matrix to a target matrix of loadings (Cliff, 1964). The initial target matrix was patterned in line with the experimental

Table 3

(Continued)

22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
17	17	16	24	25	04	-01	01	21	17	17	01	23	17	13	21	22	22	20	15	17	20	15	07	14	15	-17	02	-08	20	-20
25	34	17	37	22	25	-06	24	30	32	13	25	29	34	14	17	31	23	19	11	35	30	40	13	34	37	07	-04	-18	45	-13
28	28	30	41	19	32	-12	24	40	26	24	14	33	35	23	20	31	29	27	28	36	36	41	19	37	35	-03	00	-08	46	-17
20	24	19	40	16	26	00	17	18	30	15	12	18	30	17	23	20	17	15	28	20	31	26	17	24	31	01	00	-14	35	-19
08	29	14	00	08	05	26	15	08	06	29	08	-02	14	07	-04	11	-02	00	07	-06	04	02	07	10	01	-21	-03	05	09	-04
17	38	14	11	05	26	09	42	-03	10	29	07	04	10	-02	01	12	13	07	14	15	11	18	04	07	16	12	-18	-10	20	-04
24	28	22	32	27	28	-13	20	28	29	15	35	25	49	18	15	40	26	17	23	41	48	39	18	48	51	-01	00	-15	38	-18
23	21	21	35	22	12	-09	29	18	33	20	16	18	25	16	11	34	26	29	26	28	26	40	12	35	39	01	-04	-19	33	-06
07	19	26	29	15	15	-12	18	20	32	13	11	26	23	15	18	36	26	18	12	24	23	28	15	17	28	-08	-03	-04	32	-09
23	28	21	40	29	23	-02	35	21	36	26	14	18	20	33	15	22	24	28	23	30	29	30	12	32	36	-03	02	-13	32	-08
-03	14	-05	14	06	05	-01	07	14	09	16	11	11	12	09	14	18	14	20	-02	10	15	08	02	14	11	-17	02	-03	09	-11
11	16	00	15	10	06	-08	14	20	19	13	09	09	10	21	12	15	12	14	17	16	10	20	13	19	19	-12	00	-05	15	-10
25	15	25	30	05	16	08	13	14	26	02	18	14	31	09	13	14	24	15	08	32	27	29	09	23	27	06	04	-10	32	-11
32	28	27	39	20	37	-06	36	30	40	28	31	44	40	16	21	39	34	28	25	50	53	78	17	48	48	-02	-03	-21	83	-24
27	28	18	29	14	21	-06	19	21	19	15	33	24	43	13	09	24	15	16	23	33	38	31	07	28	30	04	04	-11	43	-15
18	19	18	26	15	14	-13	13	25	18	20	17	18	17	12	09	20	14	16	23	18	32	27	19	22	23	-03	08	-01	24	-14
39	44	35	43	10	26	03	28	34	37	25	38	37	59	20	23	33	32	30	16	47	53	56	15	41	61	24	-11	-12	59	-18
29	26	37	42	18	24	-17	27	35	33	18	27	29	36	25	11	33	26	29	33	34	41	43	11	34	41	01	06	-16	44	-17
16	21	19	31	09	22	-06	15	25	26	16	02	27	25	18	16	34	22	21	17	29	27	23	08	27	24	-07	02	-03	29	-05
29	12	04	19	11	22	-04	13	15	08	03	25	17	27	01	08	06	06	15	28	20	28	24	17	11	13	04	-06	03	26	-16
22	24	25	41	21	28	-08	24	31	35	15	17	30	31	20	14	41	26	32	23	42	33	39	12	30	34	-09	06	-11	41	-08
	18	23	19	17	19	11	20	12	14	13	12	15	26	08	11	17	14	11	29	24	24	29	10	27	23	-04	-09	-07	38	-15
18		19	27	12	33	14	40	27	27	42	26	15	32	11	07	27	16	14	20	23	26	26	11	28	31	09	-07	-08	42	-20
23	19		32	-04	12	04	12	22	25	08	10	14	29	19	01	17	15	22	25	12	34	18	03	18	16	-01	02	-04	19	04
19	27	32		03	18	-12	24	25	39	16	23	26	32	12	16	38	25	31	18	35	32	37	18	28	40	03	10	-15	37	-11
17	12	-04	03		14	-07	12	14	23	15	04	13	12	03	15	06	04	05	13	14	14	15	10	16	16	-15	-10	-08	19	-06
19	33	12	18	14		-04	30	20	19	17	18	19	28	02	16	16	22	09	19	22	26	29	20	27	22	03	04	-07	38	-09
11	14	04	-12	-07	-04		-03	12	-08	21	-21	-16	-07	03	00	-06	-20	-10	-14	-02	-12	-18	01	-05	-15	-10	04	-14	-03	-03
20	40	12	24	12	30	-03		12	25	35	31	19	22	04	04	24	15	14	19	31	23	37	13	26	28	20	-03	-15	35	-18
12	27	22	25	14	20	12	12		19	17	14	22	22	11	20	21	20	22	14	14	38	32	20	24	23	-08	-02	-01	37	-18
14	27	25	39	23	19	-08	25	19		10	12	17	25	17	25	28	25	19	22	31	33	33	13	29	45	-03	04	-21	36	-03
13	42	08	16	15	17	21	35	17	10		19	23	27	12	06	20	12	15	13	17	18	24	13	28	13	05	-13	-12	30	-13
12	26	10	23	04	18	-21	31	14	12	19		16	32	00	02	14	22	09	18	19	32	29	05	28	26	22	-04	-06	32	-18
15	15	14	26	13	19	-16	19	22	17	23	16		32	12	16	31	21	19	08	27	33	42	13	38	25	-03	-07	-08	43	-25
26	32	29	32	12	28	-07	22	22	25	27	32	32		13	19	28	25	17	23	34	39	36	11	34	34	08	08	-07	51	-25
08	11	19	12	03	02	03	04	11	17	12	00	12	13		12	20	10	22	11	18	19	16	09	14	26	-06	10	-14	17	-04
11	07	01	16	15	16	00	04	20	25	06	02	16	19	12		25	23	24	03	26	23	13	04	08	15	-17	03	-15	28	-09
17	27	17	38	06	16	-06	24	21	28	20	14	31	28	20	25		22	33	10	42	37	38	15	24	35	-15	03	-14	44	-08
14	16	15	25	04	22	-20	15	20	25	12	22	21	25	10	23	22		18	07	20	25	33	15	30	25	-06	01	01	33	-18
11	14	22	31	05	09	-10	14	22	19	15	09	19	17	22	24	33	18		00	21	30	32	05	20	22	-01	05	-16	30	-05
29	20	25	18	13	19	-14	19	14	22	13	18	08	23	11	03	10	07	00		20	13	21	13	16	16	-05	-06	12	23	-03
24	23	12	35	14	22	-02	31	14	31	17	19	27	34	18	26	42	20	21	20		39	47	10	33	47	06	00	-21	55	-18
24	26	34	32	14	26	-12	23	38	33	18	32	33	39	19	23	37	25	30	13	39		51	13	40	55	03	-08	-17	57	-17
29	26	18	37	15	29	-18	37	32	33	24	29	42	36	16	13	38	33	32	21	47	51		17	45	53	08	-05	-19	70	-25
10	11	03	18	10	20	01	13	20	13	13	05	13	11	09	04	15	15	05	13	10	13	17		10	12	-04	03	-09	13	-10
27	28	18	28	16	27	-05	26	24	29	28	28	38	34	14	08	24	30	20	16	33	40	45	10		41	-04	-07	-15	46	-16
23	31	16	40	16	22	-15	28	23	45	13	26	25	34	26	15	35	25	22	16	47	55	53	12	41		08	01	-20	54	-21
-04	09	-01	03	-15	03	-10	20	-08	-03	05	22	-03	08	-06	-17	-15	-06	-01	-05	06	03	08	-04	-04	08		-08	00	08	03
-09	-07	02	10	-10	04	04	-03	-02	04	-13	-04	-07	08	10	03	03	01	05	-06	00	-08	-05	03	-07	01	-08		-04	-03	-08
-07	-08	-04	-15	-08	-07	-14	-15	-01	-21	-12	-06	-08	-07	-14	-15	-14	01	-16	12	-21	-17	-19	-09	-15	-20	00	-04		-19	13
38	42	19	37	19	38	-03	35	37	36	30	32	43	51	17	28	44	33	30	23	55	57	70	13	46	54	08	-03	-19		-27
-15	-20	04	-11	-06	-09	-03	-18	-18	-03	-13	-18	-25	-25	-04	-09	-08	-18	-05	-03	-18	-17	-25	-10	-16	-21	03	-08	13	-27	

Table 4

Unrotated Factor Matrix

Tests	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	h^2
1. Cartoon Analogies	37	36	-04	-05	02	18	-06	08	24	-01	04	16	09	08	11	08	11	02	05	45
2. Cartoon Exchange	59	-06	06	-03	03	04	14	00	02	-18	03	-14	15	-09	07	09	17	11	-20	56
3. Cartoon Implications	67	23	-03	-08	-06	-02	-12	06	00	-01	02	01	15	-08	-15	-06	03	-03	11	60
4. Cartoon Predictions	51	17	-05	-21	02	-05	08	13	-06	-09	-16	-11	-05	02	-04	16	-02	04	28	52
5. Consequences - obvious	14	02	-44	-16	13	15	-07	-21	04	08	-03	-18	-12	16	06	04	-04	-13	01	43
6. Consequences - remote	23	-27	-43	24	-17	-26	08	14	09	-15	06	17	06	-15	-09	01	09	-04	00	60
7. DAT Abstract Reasoning	67	-19	22	-26	-02	25	19	-12	38	-08	07	-07	06	-08	-06	-21	-01	-04	07	94
8. Expressions	57	25	-05	00	-11	-10	15	-12	-03	08	14	02	07	07	16	-04	02	-05	09	52
9. Expression Exchange	42	10	06	19	05	-08	-09	08	25	-06	-05	-08	-06	12	06	-06	-03	06	-12	37
10. Expression Grouping	58	38	-21	02	-14	-09	27	-03	-04	10	-07	20	04	05	-01	-16	-09	18	-06	76
11. Faces	23	28	-10	16	05	12	-01	-26	-22	-15	00	15	07	-03	02	00	-06	-11	03	37
12. Facial Situations	32	32	-11	-06	-10	21	11	-09	-19	06	-11	-15	-16	00	-16	03	22	-08	-13	49
13. Figure Matrix Test	44	-11	11	-19	25	-12	21	-04	-30	-06	-04	-03	11	16	01	-17	-06	-08	-03	55
14. Henmon-Nelson Vocabulary	75	-27	06	19	-01	03	-13	19	-06	23	00	-14	05	11	01	03	-03	-09	02	82
15. Hidden Figures	52	-24	09	-32	03	09	04	-03	01	-07	13	08	-11	07	-04	-03	-02	03	-09	51
16. Inflections	42	25	-07	-05	-16	03	-18	-08	-05	10	-06	08	-06	-08	12	01	-04	03	-04	36
17. ITED Quantitative Thinking	75	-35	04	-03	26	-06	06	-07	-12	-03	-07	09	05	-04	00	18	15	10	01	86
18. Missing Cartoons	71	24	08	-19	-08	-20	-11	-14	01	-04	13	-09	20	-19	-01	10	02	-12	09	82
19. Missing Pictures	50	31	-03	02	06	-07	-11	11	-19	-14	11	-11	-07	01	-15	09	-20	10	-13	56
20. Mutilated Words	34	-08	05	-32	-20	09	-14	17	-19	-02	04	15	-21	-06	11	-05	-02	08	-04	45
21. Odd Strip Out	65	24	06	-05	02	-06	-05	04	-04	-11	18	-16	03	-03	03	01	-07	-04	-05	58
22. Penetration of Camouflage	42	-15	-10	-27	00	-06	04	22	-07	14	16	17	02	07	02	00	12	-06	-05	44
23. Pertinent Questions	50	-19	-45	05	01	03	00	-08	08	-14	-10	-06	-04	-07	01	10	02	02	-08	56
24. Picture Arrangement	40	00	-04	-17	26	-48	-24	-07	24	15	-09	07	02	09	-03	-05	-01	-05	-10	67
25. Picture Exchange	60	09	08	05	06	-23	00	-03	-02	-14	-06	-04	-12	06	18	-05	08	20	13	58
26. Picture Exclusion	28	12	-06	-07	-19	26	19	18	18	06	-02	06	17	05	15	10	-10	-03	-11	40
27. Picture-Group Naming	42	-17	-13	00	-16	01	-08	22	-03	-17	-15	-05	07	-07	-15	-11	-15	-04	02	43
28. Plot Titles - low quality	-11	-09	-52	-14	52	10	07	16	-09	10	09	-03	07	-09	11	-09	-04	02	04	69
29. Plot Titles - high quality	44	-20	-33	20	-26	-13	08	-04	-03	-05	05	-03	-05	00	03	-08	-03	-04	-05	50
30. Questions II	45	08	-04	-05	16	17	-26	02	-01	01	-19	-04	12	-23	09	-07	06	-02	-14	48
31. Reflections	52	08	03	12	04	-12	23	09	08	04	-23	-11	-08	09	13	10	-10	-06	-08	50
32. Seeing Problems	36	-07	-52	14	-02	17	-12	-12	05	04	07	06	02	10	-04	03	-02	09	12	53
33. Seeing Trends I	39	-31	05	-08	-24	06	-08	-33	-07	-12	-10	08	-07	06	08	-01	02	-03	-05	49
34. Sentence Order	47	-05	13	16	00	15	-24	06	-01	01	10	01	08	14	-09	09	-02	22	00	45
35. Ship Destination Test	58	-22	03	-16	10	06	-08	-07	04	-14	-01	08	-05	16	-10	09	-02	05	06	52
36. Silhouette Relations	30	23	-01	01	18	01	15	-07	12	25	-01	07	-14	-06	-33	-01	09	05	-05	43
37. Social Relations	29	13	10	16	19	20	06	28	-01	-18	-15	22	-08	06	-02	08	03	-19	04	45
38. Social Translations	54	08	05	29	17	06	-06	-02	16	-13	26	-10	-27	-02	05	-09	02	-09	04	64
39. Sound Meaning	42	02	12	18	-02	-01	-05	-01	00	-12	-18	07	15	19	-09	-13	10	-10	00	38
40. Stick Figure Opposites	40	16	08	19	14	-03	-08	-08	-04	01	08	19	-07	-03	03	-07	10	-03	-02	33
41. Street Gestalt Completion	36	03	-10	-29	-29	-16	-05	13	07	09	-01	-02	-15	04	-06	07	05	-11	02	41
42. Verbal Analogies I	58	-11	11	12	05	02	16	14	-08	-01	21	00	-12	-04	-02	-02	-05	-05	01	50
43. Verbal Classification	65	-15	18	04	10	08	-14	-07	02	14	-13	20	-10	-20	04	01	-23	-05	00	70
44. Verbal Comprehension	70	-22	14	25	-12	03	-09	06	-17	31	06	-10	07	02	06	-01	13	-06	03	82
45. Who Said It?	24	03	-07	-03	-06	12	-09	14	00	02	-20	-14	-10	-06	04	-27	13	12	10	30
46. Word Classification	57	-11	01	04	-04	13	02	-12	-03	14	01	-04	18	11	-11	-03	-11	06	02	47
47. Word Matrix Test	65	-12	17	15	01	-02	29	-10	03	16	-09	-03	-08	-20	02	10	-06	06	08	69

Note. —Decimal points omitted.

Table 5

Rotated Factor Matrix

Tests	hfc[a]	CMU	CMC	CMR	CMS	CMI	DMU	DMT	NMU	NMS	CFU	CFR	NFT	CBU	CBC	CBR	CBS	CBT	CBI	Res.	h^2
1. Cartoon Analogies	CBR	-01	00	-09	-05	19	-08	-13	-12	05	03	00	18	23	22	37	10	20	20	05	45
2. Cartoon Exchange	CBT	11	04	13	29	07	-07	05	05	-05	-09	13	21	11	18	01	28	40	11	24	55
3. Cartoon Implications	CBI	17	22	-07	06	09	-08	14	02	07	11	18	11	24	13	24	41	20	30	00	61
4. Cartoon Predictions	CBI	02	05	06	20	09	04	-03	01	-05	18	09	05	07	07	10	26	16	55	-07	52
5. Consequences - obvious	DMU	01	-09	-01	01	40	45	-10	08	10	09	09	-03	12	00	-01	09	-02	04	-01	44
6. Consequences - remote	DMT	05	-02	06	07	24	-02	69	10	02	-02	-09	10	-04	05	02	-05	07	08	06	60
7. DAT Abstract Reasoning	CFR	05	28	20	04	21	-14	-07	14	00	09	66	27	03	10	14	09	34	14	21	95
8. Expressions	CBU	13	-04	22	00	12	-05	09	-12	09	08	19	09	36	27	08	26	17	20	-13	53
9. Expression Exchange	CBT	09	07	07	-05	05	-04	01	09	27	-04	-01	00	02	16	16	10	43	11	03	37
10. Expression Grouping	CBC	-08	16	17	04	06	06	22	-11	05	18	08	-02	27	59	19	27	16	18	-12	77
11. Faces	CBU	-06	02	04	07	09	01	03	11	-09	-17	01	-11	40	09	19	22	-03	-02	-19	37
12. Facial Situations	CBS	11	-11	07	09	09	13	-09	05	-20	23	05	-18	12	21	21	42	05	00	09	49
13. Figure Matrix Test	CFR	11	03	13	33	-25	20	02	11	06	-07	37	16	09	15	-04	18	10	14	-17	55
14. Henmon-Nelson Vocabulary	CMU	65	25	20	13	10	04	09	18	16	04	06	16	05	09	09	14	27	22	00	81
15. Hidden Figures	NFT	04	16	16	26	09	02	-04	18	07	22	29	39	00	05	06	15	18	01	00	51
16. Inflections	CBU	06	14	04	-02	09	-02	-02	05	09	24	-08	01	38	15	10	22	13	09	01	36
17. ITED Quantitative Thinking	CMS	24	21	26	65	09	05	13	08	10	-02	16	23	14	01	11	11	26	19	08	87
18. Missing Cartoons	CBS	10	10	08	09	08	-19	10	-03	19	07	25	16	41	-01	05	52	16	35	10	82
19. Missing Pictures	CBS	-01	17	06	05	-02	07	02	09	10	00	-14	08	06	11	12	58	23	17	-15	56
20. Mutilated Words	CFU	04	16	02	10	-06	-02	-03	17	-09	45	-03	34	14	02	00	11	13	03	-07	45
21. Odd Strip Out	CBC	11	08	12	00	02	-02	02	04	10	00	12	19	22	08	10	50	34	23	-04	58
22. Penetration of Camouflage	NFT	20	02	04	18	00	11	16	-04	07	25	11	45	05	12	10	09	02	10	01	44
23. Pertinent Questions	CMI	04	07	11	22	41	23	28	22	04	02	-01	06	12	09	01	12	24	13	14	55
24. Picture Arrangement	NMS	01	06	-03	16	-07	14	15	-03	67	11	14	06	12	-03	09	08	14	19	11	66
25. Picture Exchange	CBI	04	03	15	25	00	-07	07	-02	15	11	08	00	22	09	05	13	51	27	-17	58
26. Picture Exclusion	CBC	06	06	08	-15	16	-03	-09	04	-10	00	-01	26	08	41	09	03	03	18	18	40
27. Picture-Group Naming	NMU	14	25	-07	03	06	02	27	35	-05	07	06	09	-04	10	-01	14	16	25	02	43
28. Plot Titles - low quality	DMU	-08	06	-12	04	08	69	13	-24	-12	-16	-01	19	01	-12	01	-12	-05	03	-01	69
29. Plot Titles - high quality	DMT	18	01	20	03	28	05	43	20	04	10	03	03	10	18	-10	11	19	04	-06	50
30. Questions II	CBU	13	26	-13	10	-02	16	-03	13	01	01	02	05	34	01	15	17	26	10	27	48
31. Reflections	CBI	13	-01	35	07	-03	09	01	13	15	-01	02	-04	06	28	10	10	27	36	08	50
32. Seeing Problems	CMI	13	16	-04	08	57	21	20	03	04	02	-03	03	14	12	10	05	08	02	-13	54
33. Seeing Trends I	NMU	10	07	15	28	20	-16	01	37	06	19	19	06	23	06	-13	01	09	-09	-01	49
34. Sentence Order	NMS	29	30	-03	17	16	-16	-09	05	12	-04	-07	13	00	10	14	18	26	02	-11	45
35. Ship Destination Test	CMS	08	18	08	37	21	-01	-03	23	17	10	21	24	01	03	13	13	19	16	-08	52
36. Silhouette Relations	CBR	-01	16	17	09	03	10	03	-21	12	12	13	-15	-06	12	40	23	02	01	10	43
37. Social Relations	CBR	07	00	07	09	-10	02	-05	22	-12	-12	-07	11	03	08	50	-01	13	22	-05	45
38. Social Translations	CBT	14	04	28	-08	17	02	06	07	10	-07	11	07	10	-13	34	21	51	00	-14	64
39. Sound Meaning	CBC	23	03	-07	16	-02	-14	08	23	11	-09	18	-07	11	22	21	07	19	11	-06	38
40. Stick Figure Opposites	CBR	10	07	13	10	-03	-04	08	-02	13	-02	03	02	27	03	34	13	22	-04	-10	34
41. Street Gestalt Completion	CFU	09	-07	04	-02	10	-04	11	09	14	45	06	16	02	08	02	20	01	26	07	42
42. Verbal Analogies I	CMR	24	15	37	09	-01	-01	15	07	-04	01	13	24	00	05	18	21	27	10	-11	50
43. Verbal Classification	CMC	18	49	33	16	00	-01	00	24	18	09	09	12	29	-02	22	04	15	15	07	71
44. Verbal Comprehension	CMU	71	21	24	16	05	-09	11	05	07	09	08	08	19	10	06	15	25	08	00	82
45. Who Said It?	CBT	13	13	-15	-02	01	11	03	04	-14	25	09	-11	06	06	04	-01	32	12	03	30
46. Word Classification	CMC	27	36	11	19	21	-02	00	04	08	-01	20	05	08	27	00	19	14	08	-05	49
47. Word Matrix Test	CMR	20	28	55	22	06	-09	08	00	00	04	17	-04	12	12	09	10	23	24	11	69

Note. —Decimal points omitted.

[a] Hypothesized factor content.

hypotheses, using the square root of each test's communality as its target loading. These loadings were selected to maximize not only the emergence of the hypothesized factors, but more importantly, to achieve simple structure (Thurstone, 1947) and to maintain positive manifold.

However, the rotated factor matrix of 22 factors did not maintain communalities, nor did it permit reproduction of the correlation matrix. The program is a simple one, designed to perform arithmetic, more specifically matrix algebra. The eigenvalues of the last factors might have been too small to permit computational accuracy. To determine if this were the case, successively smaller numbers of factors were submitted for algebraic rotation. The largest number of factors capable of maintaining communalities was 19. This number of factors was retained because better simple structure was achieved with it than with a smaller number. These 19 principal factors account for 92.5 percent of the variance and are given in Table 4.

The final target matrix (see Appendix B) was quite similar to the initial one described above. The sizes of some loadings were changed slightly and not all variables were patterned in line with original hypotheses. Changes in the final target matrix were decided primarily on the basis of simple-structure dictates. The rotated factor matrix obtained in this way is given in Table 5. The accuracy of this solution may be seen in the agreement of the communalities of the unrotated and rotated matrices. There is only one difference as large as .02, easily accounted for in terms of rounding error. The post-multiplication of the rotated factor matrix by its transpose reproduced the correlation matrix almost perfectly. The frequency distribution of differences between the original and the reduced correlation matrix was leptokurtic about a mean of zero with a range from plus to minus .05.

INTERPRETATION OF THE FACTORS

The factors found in this study will be discussed primarily in terms of tests having loadings of .30 or greater on them. The choice of .30 as a "significant" factor loading was made on the basis of convention. The factors will be discussed in the order in which they are presented in Table 5. First the reference factors, semantic and figural, will be given, then the experimental-behavioral factors.

Reference Factors

CMU Cognition of semantic units

44. Verbal Comprehension (CMU)	.71	
14. Henmon-Nelson Vocabulary (CMU)	.65	

Verbal Comprehension and Henmon-Nelson Vocabulary clearly define this as the unfailing verbal-comprehension factor. No other semantic tests had significant loadings on it, and, what is more encouraging, no behavioral tests involved CMU significantly.

CMC Cognition of semantic classes

43. Verbal Classification (CMC)	.49	(CMR .33)
46. Word Classification (CMC)	.36	
34. Sentence Order (NMS)	.30	

Earlier factor analyses have had some difficulty in separating tests designed as markers for the factors CMU, CMC, and CMR. There is just a little of such confusion here. In the past, Word Classification has most often lost its CMC univocalness to CMU. This is not particularly true here. Verbal Classification has most often been complicated by having loadings on the CMR factor (Kettner, et al., 1959) as here.

CMR Cognition of semantic relations

47. Word Matrix Test (CMR)	.55	
42. Verbal Analogies I (CMR)	.37	
31. Reflections (CBI)	.35	(CBI .36)
43. Verbal Classification (CMC)	.33	(CMC .49)

Although there is some confusion with the CMC factor, the strong loading of Word Matrix Test and the unique loading of Verbal Analogies I clearly define this as the predicted reference factor, CMR.

Also loaded on this factor is the only behavioral test that has a significant non-behavioral loading. That this particular behavioral test should be loaded on a semantic factor is not surprising. A high score on Reflections, which is hypothesized to measure the behavioral-implications factor, depends relatively little on correct interpretation of vocal inflections. The more essential task is an understanding of the subtle uses of language to convey emotion or feeling. The position of subject and verb in the sentence and the length of the sentence are but two of the cues writers may use to convey emotion or to delineate character. Just how relations are involved in this test is not clear.

Social Translations, another behavioral test presented in verbal form, does not have a significant loading on this factor, but a loading of .28 suggests that this behavioral test also demands a bit of verbal adroitness.

CMS Cognition of semantic systems

17. ITED Quantitative Thinking (CMS)	.65	
35. Ship Destination Test (CMS)	.37	
13. Figure Matrix Test (CFR)	.33	(CFR .37)

ITED Quantitative Thinking and Ship Destination Test were the two measures hypothesized to define the general-reasoning factor, CMS. The significant loadings of both these tests on only this factor satisfactorily define it as such.

The loading of Figure Matrix Test on the same factor as Ship Destination Test is not a new finding (Guilford, et al., 1951; Hertzka, et al., 1954). Both tests have previously loaded together on a factor called eduction of perceptual relations, later identified as CFR. Although Figure Matrix Test helped define its hypothesized factor, CFR, its loading on CMS would not argue well for its univocality.

Relevant to the purposes of this study is the fact that three fourths of the tests designed as measures of behavioral intelligence are in the hyperplane of this factor. Superior general-reasoning ability would not seem essential to superior performance on the newly devised behavioral-intelligence tests, a point about which there had been some concern.

CMI Cognition of semantic implications

32. Seeing Problems (CMI)	.57	
23. Pertinent Questions (CMI)	.41	
5. Consequences - obvious (DMU)	.40	(DMU .45)

In discussing the construction of the CBI tests, the recent (Nihira, et al., 1964) merging of the conceptual-foresight and sensitivity-to-problems factors was mentioned. The CMI factor found in this analysis is led by

Seeing Problems, formerly considered an EMI (sensitivity-to-problems) marker test. Loaded with Seeing Problems is Pertinent Questions, a traditional CMI marker variable. The unique loadings of these tests on the same factor lends strong support to the broadening of the definition of factor CMI to include both foresight and sensitivity to problems.

The significant loading of Consequences - obvious on factor CMI should be noted. Although Consequences - obvious has been loaded with both Seeing Problems and Pertinent Questions in other analyses (Berger, et al., 1957; Guilford, et al., 1961), its loadings have always been barely significant, and, therefore, easily overlooked. Viewing Consequences - obvious as a measure of CMI is quite sensible. Conceptual foresight would seem called for when one is asked "What would be the results if... ?" There is a great deal of similarity among the tasks of Consequences, Seeing Problems, and Pertinent Questions (see Appendix A). All three tests actually ask E to anticipate consequences of one kind or another.

It may be that Consequences - obvious has not been loaded more strongly with Pertinent Questions and Seeing Problems in the past because these two tests have not both been used to define the same factor in a test battery which included Consequences until now. With the strengthening of the CMI factor, however, the relationship of Consequences to it is made more obvious.

DMU Divergent production of semantic units

28. Plot Titles - low quality (DMU)	.69	
5. Consequences - obvious (DMU)	.45	(CMI .40)

Plot Titles - low quality and Consequences - obvious define this factor as that of ideational fluency, DMU. The relation of Consequences - obvious to the CMI factor has just been pointed out.

DMT Divergent production of semantic transformations

6. Consequences - remote (DMT)	.69	
29. Plot Titles - high quality (DMT)	.43	

The originality factor in this analysis was led by Consequences - remote and further defined by Plot Titles - high quality, as anticipated, with no significant secondary loadings.

NMU Convergent production of semantic units

33. Seeing Trends I (NMU)	.37	
27. Picture-Group Naming (NMU)	.35	

The concept-naming factor is uniquely defined by its two marker tests, Seeing Trends I and Picture-Group Naming. It should be noted that no behavioral tests are loaded on this factor, indicating that this form of verbalization ability is not essential to the tasks presented in the behavioral tests. It is still possible that if a behavioral test required naming of expressions it would be loaded on NMU. The care taken to avoid this seems to have been worthwhile.

NMS Convergent production of semantic systems

24. Picture Arrangement (NMS)	.67	

Although both Picture Arrangement and various forms of Sentence Order have consistently defined the semantic-ordering factor, NMS (Berger, et al., 1957; Guilford, et al., 1961; Petersen, et al., 1963), these two tests did not cohere in this factor analysis. (Sentence Order had a barely significant loading on the CMC factor.) The shortened form of Picture Arrangement used in this study proved to be very easy for the Es. Most of them got perfect scores. Sentence Order, on the other hand, was moderately difficult, with no one achieving a perfect score. This difference in difficulty might be the reason for the separation of the tests.

This singlet is considered to be the hypothesized NMS factor because of the high, unique loading of Picture Arrangement on it. Although Picture Arrangement is a test composed solely of cartoons, none of the behavioral-cartoon tests is loaded with it. The fact that the cartoon tests are not all loaded on the same factor is at least partial proof that the kind of stimulus used is not the most important element in the testing situation. The content, in the SI sense, of the kind of intellectual material to be processed, whether semantic or behavioral, is of greater significance.

CFU Cognition of figural units

41. Street Gestalt Completion (CFU)	.45	
20. Mutilated Words (CFU)	.45	(NFT .34)

Street Gestalt Completion leads the speed-of-closure factor, Thurstone's Closure$_1$ (Thurstone, 1944), with its unique loading of .45. Mutilated Words, the other marker test of CFU, has its highest loading on this factor, but has a side loading on NFT as well.

The flexibility-of-closure factor, NFT, is led by Penetration of Camouflage. Street Gestalt Completion, Mutilated Words, and Penetration of Camouflage have been found loaded on the same factor before (Guilford, et al., 1952). The fact that Mutilated Words split between the CFU and NFT factors in this analysis is therefore not unprecedented.

CFR Cognition of figural relations

7. DAT Abstract Reasoning (CFR)	.66	
13. Figure Matrix Test (CFR)	.37	(CMS .33)

The figural-relations factor is led by DAT Abstract Reasoning. Although Figure Matrix Test is also loaded on the CFR factor, it is not unique to this factor. The factorial complexity of Figure Matrix Test may be explained by the greater complexity of its task. In the DAT Abstract Reasoning test, the figural relation in each item is a one-way trend. In Figure Matrix Test, trends in two directions must be considered.

NFT Convergent production of figural transformations

22. Penetration of Camouflage (NFT)	.45	
15. Hidden Figures (NFT)	.39	
20. Mutilated Words (CFU)	.34	(CFU .45)

Flexibility of closure (Thurstone's Closure$_2$) is defined by the unique loadings of its two hypothesized marker tests, Penetration of Camouflage and Hidden Figures. Although both marker tests have unique loadings on factor NFT, this factor does exhibit some lack of conformance to simple structure, as shown by the one stray relationship with Mutilated Words.

Considering that most of the behavioral test stimuli are visual-figural, it is relevant that none of the behavioral variables has a significant loading on any of the three figural reference factors.

Experimental Factors

CBU Cognition of behavioral units

18. Missing Cartoons (CBS)	.41	(CBS .52; CBI .35)
11. Faces (CBU)	.40	
16. Inflections (CBU)	.38	
8. Expressions (CBU)	.36	
30. Questions II (CBU)	.34	

Although the behavioral-units factor is led very slightly by Missing Cartoons, a test designed to measure CBS, the other four tests defining it are those hypothesized to do so. Missing Cartoons is a complex test, as may be seen from its pattern of correlations. To answer the items of this test correctly, attention must be paid to the expressions of each cartoon character. In the light of this consideration, its loading on CBU is not amiss.

Three of the other four tests defining the CBU factor, Faces, Inflections, and Questions II, assess mainly the ability to understand facial expressions. Inflections was devised to discover whether a vocal inflection could be used to indicate a behavioral unit. However, item analyses indicated that the test's difficulty lay not in the tape-recorded inflections, but in the drawings of the matching facial expressions.

The fourth test, Expressions, uses a variety of expressions not exclusively facial. Expressions has a significant loading on the CBU factor, but its loading of .27 on factor CBC is nearly as high. As will be seen, a characteristic common to the tests defining factor CBC is that each presents E with a variety of expressional modes. The ability to understand that different modes of expression may convey the same social meaning is an important feature of the tests of factor CBC.

Expressions is the only behavioral-units test in which any but facial expressions were effectively used. Its factor-loadings pattern is not strongly univocal on CBU. Three of the five tests defining the CBU factor are concerned almost exclusively with interpretation of facial expression. For these reasons, the CBU factor might be regarded, in this analysis, as the ability to understand facial expressions. It will require a new analysis in which one or more tests composed of non-face expressions also appear to decide upon the generality of the CBU factor.

CBC Cognition of behavioral classes

10.	Expression Grouping (CBC)	.59
26.	Picture Exclusion (CBC)	.41

Expression Grouping, a test composed of drawings, and Picture Exclusion, a test with a photographic format, clearly define the hypothesized behavioral-classes factor. Considering in addition the .27 loading of Expressions, the CBC factor is interpreted as the ability to cognize different modes or units of expression as communicating the same thought or feeling. As with factor CBU, this interpretation of the CBC factor applies to the dimension isolated in the present analysis. Theoretically, the ability to cognize behavioral classes might also be measured by tests in each of which only one behavioral modality is used. Single-mode CBC tests, unlike single-mode CBU tests, would not require precision in matching the behavioral units used. Instead, in the CBC tests, E would have to cut across the specific social meaning of each behavioral unit to comprehend the underlying feeling, motivation, or disposition shared by all of them.

Odd Strip Out, intended as a test of the ability to classify systems of behavior, is not loaded on this factor. This finding tends to support the interpretation of CBC as a classing-of-units factor.

Sound Meaning, another hypothesized CBC test, in which three emotive sounds are to be classed and verbally designated, has no significant loading on any factor. The low reliability of this test is at least a partial explanation for this occurrence.

Sound Meaning's loadings on factors CBC, CMU, and NMU, although small (about .22), deserve some comment. Sound Meaning is the only CBC test in which only one behavioral mode, emotive sound, is used. Although this test is not loaded significantly on its hypothesized factor, considering its low reliability, its .22 loading on CBC lends some support to the view that CBC may include more than multi-mode behavioral classification.

Although the alternative words used in Sound Meaning were chosen to be maximally disparate, the loadings of this test on the CMU and NMU factors indicate that verbal variance was not sufficiently controlled. These verbal-factor loadings call to mind the difficulties with earlier social-intelligence tests which also used verbal-labeling procedures.

CBR Cognition of behavioral relations

37.	Social Relations (CBR)	.50	
36.	Silhouette Relations (CBR)	.40	
1.	Cartoon Analogies (CBR)	.37	
40.	Stick Figure Opposites (CBR)	.34	
38.	Social Translations (CBT)	.34	(CBT .51)

All four of the tests designed as measures of the ability to cognize behavioral relations are univocally loaded on this factor. The two tests leading on factor CBR, Social Relations and Silhouette Relations, were especially constructed to assess the ability to understand two-person interaction. These tests have higher and more univocal loadings than the other two CBR tests, and if attention were restricted to these two tests, the factor might be interpreted as ability to cognize diadic interactions, but two tests of other types speak for greater generality for the factor.

Cartoon Analogies also tested the ability to comprehend pair relationships to some extent, but most of the relations on which the items were based depended on behavioral situations rather than on one-to-one interactions. The expressional units used in Cartoon Analogies were more difficult to cognize than the schematic ones used in Social Relations and Silhouette Relations. This may be the reason Cartoon Analogies is loaded in the .20's on most of the other behavioral factors and is not loaded more highly on factor CBR.

Stick Figure Opposites was constructed to test the hypothesis that one kind of relation, opposition, could be effectively used in a relations test. The loading of this test on the CBR factor indicates that this may be the case. The oppositions, of course, are along different variables of feeling, such as excited-calm and tense-relaxed. A loading of .27 on factor CBU indicates that understanding of the individual postures used has some slight bearing on success in this test.

The significant loading of Social Translations, a test hypothesized to measure CBT, while unexpected, is easily explained. In this test, the task emphasis is on the different social meanings that a statement may have when expressed between different pairs of people. Although the cognition of the statement's transformation is an essential operation, this cognition could not occur unless one understood the kind of relationship usually holding between the alternative pairs. Cognition of the diadic relation is basic to cognition of the given transformation.

CBS Cognition of behavioral systems

19. Missing Pictures (CBS)	.58		
18. Missing Cartoons (CBS)	.52	(CBU .41;	CBI .35)
21. Odd Strip Out (CBC)	.50		(CBT .34)
12. Facial Situations (CBS)	.42		
3. Cartoon Implications (CBI)	.41		(CBI .30)

The three tests constructed to measure CBS, the comprehension of an integrated social situation, are loaded on this factor. Missing Pictures, a pictorial test, seems to be the best measure of factor CBS, probably because its item situations are fairly gross, and little skill is necessary to understand the individual expressions used.

Missing Cartoons also has a high loading on this factor. Yet despite its format, which is very similar to that of Missing Pictures, a univocal CBS test, Missing Cartoons is the most complex test in this battery. In answering most of the items in Missing Cartoons, E must attend closely to each cartoon character's facial expression. How the pivotal character feels may determine the start or finish of many of the cartoon strips. Missing Cartoons' loading on factor CBU is thus not surprising. In Missing Pictures, on the other hand, since unskilled actors were used, greater reliance was placed on the social situation itself to convey the behavioral information.

Missing Cartoons' loading on the CBI factor is also of interest. Of the cartoon panels which are to be placed in the sequences of Missing Cartoons, one third of them are the fourth or last cartoon in the strip. The task for these items would be very like that in Cartoon Predictions, a test hypothesized to measure CBI. E is to predict what will happen, what will follow from a given situation. Furthermore, the prediction could possibly be made from only one or two preceding scenes, without grasping the whole story.

Conversely, only one third of the items in Cartoon Implications, hypothesized to measure CBI, are of the what-will-happen, predictive type. The remaining items in Cartoon Implications refer to what led up to or preceded the given situation. These "precedent" items organize or explain the given situation. Such reasoning may explain why Cartoon Implications is loaded significantly on factor CBS, and why Missing Cartoons is loaded on the CBI factor.

Considering the splitting of these two tests between factors CBS and CBI, it is suggested that behavioral implications be defined as behavioral predictions. When one makes a prediction, there is usually no way of immediately checking one's response. In understanding systems, however, one can compare both ends with the middle, thus verifying the consistency of one's structuring. Unless the behavior in the strip is highly overdetermined, cartoon strips with the last panel missing would not seem to be suitable stimuli for testing comprehension of behavioral systems.

Facial Situations is a photographic test, similar in format to Social Relations, the leading CBR measure. The significant loading of Facial Situations on the CBS factor may be taken to mean that two people may constitute a system rather than a relationship, so long as they are reacting to a third stimulus rather than to one another.

In pretesting Odd Strip Out, it was obvious that this classes-of-systems test demanded a great deal of systems comprehension. Odd Strip Out is not loaded at all on its hypothesized CBC factor, but exhibits much of its variance on this behavioral-systems factor. It seems that understanding the systems in Odd Strip Out is the most important aspect of the task for individual differences.

Three of the four tests that use Ferd'nand cartoons, Missing Cartoons, Odd Strip Out, and Cartoon Implications, are loaded on this factor. This cluster might lead one to think that the CBS factor is essentially a Ferd'nand dimension. However, the substantial, univocal loadings of two photographic tests, Missing Pictures and Facial Situations, refute such an interpretation. It is more likely that factor CBS reflects a behavioral ability than one based on format or on subject matter.

CBT Cognition of behavioral transformations

25. Picture Exchange (CBT)	.51	
38. Social Translations (CBT)	.51	(CBR .34)
9. Expression Exchange (CBT)	.43	
2. Cartoon Exchange (CBT)	.40	
21. Odd Strip Out (CBC)	.34	(CBS .50)
7. DAT Abstract Reasoning (CFR)	.34	(CFR .66)
45. Who Said It? (CBT)	.32	

The hyperplane of this factor, identified as the hypothesized CBT factor, is not as dense as simple structure would demand. The relatively large number of tests designed to measure it, and the consequent overdetermination of the factor may be held partially accountable. Another reason for the large number of loadings in the .20's on this factor may be the nature of the tests used to measure behavioral transformations.

The five CBT tests include transformations of units (Expression Exchange, Who Said It?), relations (Social Translations), and systems (Cartoon Exchange, Picture Exchange). Comprehension of each of these product categories underlies comprehension of a transformation performed on it. Although attempts were made to control for this fact, some factor complexity was expected.

Three of the five behavioral-transformations tests have univocal and substantial loadings on this factor. Picture Exchange and Cartoon Exchange involve understanding a change or redefinition in the meaning of a social system. Expression Exchange is a measure of one's ability to cognize that the same gesture (an expressional unit) may convey many different emotional states. Since tests of both transformed units and transformed systems uniquely define this factor, it would seem that interpretation should reflect the fact that a transformation occurred, regardless of the product transformed.

Social Translations, in which the behavioral meaning of a verbal statement is redefined, also has a substantial loading on factor CBT. This loading is further evidence that the transformation, rather than the transformed object, is the element common to the variables loaded on factor CBT. Social Translations' side loading on factor CBR has already been discussed.

Although the humor test, Who Said It?, did emerge on its hypothesized behavioral factor, its loading is minimal. This low loading may be attributed to the test's low reliability. That Who Said It? was loaded at all as hypothesized, however, is encouraging. Conceptualizing humor as a kind of cognition is not a common approach, and may prove ultimately to be a useful one.

Odd Strip Out's main loading is on the CBS factor. A .34 on the behavioral-transformations factor may be traced to a certain feature of the task E is given in this test. E is asked to choose the one of three cartoon strips in which Ferd'nand behaves differently than he does in the other two. In other words, E must cognize a change or transformation in Ferd'nand's personality.

CBI Cognition of behavioral implications

4. Cartoon Predictions (CBI)	.55		
31. Reflections (CBI)	.36		(CMR .35)
18. Missing Cartoons (CBS)	.35	(CBS .52;	CBU .41)
3. Cartoon Implications (CBI)	.30		(CBS .41)

In discussing the CBS factor, it was suggested that although implications is usually defined to include both antecedents and consequents, behavioral implications might be better defined to exclude behavioral antecedents. It was argued that when the consequents are given and the antecedents are to be determined, E may justify one end of the sequence against the other. It was felt that this organization of a whole is more appropriately considered a behavioral system. The word implications implies lack of certainty, open-endedness. The probabilistic nature of behavioral predictions makes them admirable occupants of the behavioral-implications cell.

The failure of the antecedent-implications test, Cartoon Implications, to be loaded strongly on the CBI factor might be attributed to some weakness in the test, rather than in the idea of antecedent implications. Remembering that CMI is also called conceptual foresight, behavioral foresight may be equally acceptable as an alternative name for CBI.

Cartoon Predictions was designed to test the consequences or predictions definition of behavioral implications. Given a cartoon situation, E is to decide what will probably happen next. Cartoon Predictions has a strong, unique loading on the CBI factor. Caution should be exercised in making an interpretation on the basis of essentially one test and one loading, but in the interest of parsimony the CBI factor in this analysis is taken to reflect the ability to make predictions about others' behavior.

Reflections was designed to test the alternative CBI definition of behavioral sensitivity-to-problems. In this test, as well as in the prediction-implications test, Cartoon Predictions, a probabilistic aspect may be detected. Many of the alternative reflections are only subtly different. Reflections' loading on the semantic-relations factor is as large as its behavioral loading. Although Reflections seems to measure some aspect of CBI, the scope of CBI was not fully explored in this analysis. Therefore, statements as to whether sensitivity to behavioral problems is a CBI aptitude must await further research.

DISCUSSION

The purposes of this study were (1) to demonstrate the existence of a factorial domain which could be called social intelligence or behavioral cognition, (2) to establish that this factorial domain includes the six factors of behavioral cognition predicted by the structure-of-intellect model, and (3) to provide reliable, factorially unique measures of these six behavioral-cognition factors.

In order to establish that the hypothesized behavioral-cognition factors define an area of intellectual ability that was previously undiscovered, marker tests for as many reference factors as were thought germane were included in the test battery. Nine factors of semantic or verbal ability were measured, including three factors of creative thinking. Since many of the behavioral tests used visual stimuli, measures of three figural- or spatial-ability factors were included as well.

Table 6 shows that the 18 obtained factors (12 reference factors, plus six behavioral factors) correspond closely to the 18 factors hypothesized. Considering the highest, significant loading of each test, only four of the 47 tests used in this analysis were not loaded as hypothesized.

The 12 reference factors hypothesized are easily identified. These reference dimensions were chosen to sample all known intellectual factors that might be relevant to the behavioral-test tasks. Therefore, the newly found behavioral-cognition factors may justly be said to reflect abilities separate from previously recognized intellectual abilities.

All six of the behavioral-cognition factors hypothesized were identified in this analysis, although no social-intelligence dimensions had been discovered earlier. The success of the structure of intellect in this previously uncharted area lends significant support to its value as a heuristic model.

Reference Factors

Although the 12 hypothesized reference factors emerged in this analysis, in some cases they did so despite lack of univocalness in their marker tests. This lack of marker-test uniqueness is noted here, because in almost every instance these same tests have demonstrated their factorial complexity in earlier studies.

Particularly noteworthy in this regard is the confusion of the marker tests for factors CMC and CMR. In the Interpretation-of-Factors section, the continuing (over many studies) complexity of Word Classification and Verbal Classification was pointed out. The need for less complex marker tests of factor CMC is obvious. Among the figural reference factors, the complexity of Figure Matrix Test, Hidden Figures, and Mutilated Words is, again, not a new finding.

An inter-factor confusion that is specific to the present study is that holding among the creativity factors, CMI, DMU, and DMT. Although this confusion might be the result of an artifact in the present study, it is more likely the result of a change in the definition of factor CMI. As noted earlier, Consequences, a DMU-DMT marker test, has several times shown a predilection for going with factor CMI or conceptual foresight. The expansion of the CMI factor to include sensitivity to problems seems to have increased Consequences' attraction to it. The more than minimally significant loading of Consequences - obvious on factor CMI calls for a reexamination of this test's factorial composition.

Relevance of the Reference Factors to the Interpretation of the Behavioral Factors

Although some of the marker tests used in this study are not as univocal as is theoretically possible, the strong definition of most of the reference factors is apparent. Based on this distinct emergence of the semantic- and figural-intelligence factors, some comments of relevance to the interpretation of the behavioral-cognition factors may be made.

Table 6

Comparison of Hypothesized and Obtained Factors

	Test Name	hfc[a]	Obtained Factors																
			CMU	CMC	CMR	CMS	CMI	DMU	DMT	NMU	NMS	CFU	CFR	NFT	CBU	CBC	CBR	CBS	CBT	CBI
14.	Henmon-Nelson Vocabulary	CMU	65																	
44.	Verbal Comprehension	CMU	71																	
43.	Verbal Classification	CMC		49	33															
46.	Word Classification	CMC		36																
42.	Verbal Analogies I	CMR			37															
47.	Word Matrix Test	CMR			55															
17.	ITED Quantitative Thinking	CMS				65														
35.	Ship Destination Test	CMS				37														
23.	Pertinent Questions	CMI					41													
32.	Seeing Problems	CMI					57													
5.	Consequences - obvious	DMU					40	45												
28.	Plot Titles - low quality	DMU						69												
6.	Consequences - remote	DMT							69											
29.	Plot Titles - high quality	DMT							43											
27.	Picture-Group Naming	NMU								35										
33.	Seeing Trends I	NMU								37										
24.	Picture Arrangement	NMS									67									
34.	Sentence Order	NMS		30																
20.	Mutilated Words	CFU										45		34						
41.	Street Gestalt Completion	CFU										45								
7.	DAT Abstract Reasoning	CFR							66									34		
13.	Figure Matrix Test	CFR			33				37											
15.	Hidden Figures	NFT								39										
22.	Penetration of Camouflage	NFT								45										
8.	Expressions	CBU									36									
11.	Faces	CBU									40									
16.	Inflections	CBU									38									
30.	Questions II	CBU									34									
10.	Expression Grouping	CBC										59								
21.	Odd Strip Out	CBC												50	34					
26.	Picture Exclusion	CBC										41								
39.	Sound Meaning	CBC																		
1.	Cartoon Analogies	CBR											37							
36.	Silhouette Relations	CBR											40							
37.	Social Relations	CBR											50							
40.	Stick Figure Opposites	CBR											34							
12.	Facial Situations	CBS												42						
18.	Missing Cartoons	CBS									41			52						35
19.	Missing Pictures	CBS												58						
2.	Cartoon Exchange	CBT													40					
9.	Expression Exchange	CBT													43					
25.	Picture Exchange	CBT													51					
38.	Social Translations	CBT											34		51					
45.	Who Said It?	CBT													32					
3.	Cartoon Implications	CBI												41						30
4.	Cartoon Predictions	CBI																		55
31.	Reflections	CBI			35															36

Note. —All obtained factor loadings of .30 or larger are given. Decimal points omitted.

[a] Hypothesized factor content.

Verbal comprehension, factor CMU, is widely regarded as the major component of the traditional concept of general intelligence. Of the 24 behavioral-cognition tests, only one is loaded higher than .15 on this factor. There is little doubt that whatever the behavioral tests measure, it is not general intelligence.

Factor CMR reflects the ability to understand relations among semantic units or ideas. Roughly speaking, it may be said that this factor reflects verbal sophistication, the ability to understand that the relation between words can change their individual meanings. The two behavioral tests that use verbal-behavioral stimuli, Reflections and Social Translations, have loadings greater than .28 on this factor. Of course, these tests are significantly loaded on their hypothesized behavioral factors as well. These loadings on a semantic-relations factor support the view that verbal presentation of behavioral stimuli in a factor test is not advisable. The two kinds of abilities, semantic and behavioral, may be as mixed in real life as they are in these tests. In demonstrating the factorial independence of the one from the other, however, a test constructor does well to separate them.

With the exception of two CBT tests, most of the behavioral-cognition tests are in the hyperplane of factor CMS or general reasoning. This factor-loadings pattern suggests that general reasoning is not essential for superior performance on the social-intelligence tests constructed for the present study.

No behavioral test has a significant loading on the CMS factor, but Cartoon Exchange and Picture Exchange are loaded more than .25 on it. Both of these behavioral-transformations tests involve transformations of systems. E must comprehend all parts of the given system as well as whether a change in one of these parts will have an effect on the whole. In Ship Destination Test, a marker test for factor CMS, E must also handle a large number of variables. With hindsight, it is not surprising that these two particular behavioral-transformations tests should be loaded in the .20's on general reasoning.

The general comment to be made about the creativity triad of factors CMI, DMU, and DMT is that neither sensitivity to problems, semantic fluency, nor originality is involved in answering the items of the behavioral-cognition tests. This finding contradicts an earlier report of correlation between semantic fluency and expressiveness and the ability to judge emotion (Weisgerber, 1956).

None of the behavioral-implications tests is loaded on the semantic-implications factor, CMI. Although the factors CMI and CBI have the operation of cognition and the product of implications in common, the content involved distinctly separates these two intellectual abilities.

NMU is the concept-naming dimension. This factor was included in the present analysis to determine whether the ability to verbalize accurately is important in answering the behavioral-cognition tests. No behavioral test is significantly loaded on this factor, so it would seem that the behavioral tests in this study do not involve labeling ability.

One of the marker tests for factor NMU, Picture-Group Naming, uses drawings of meaningful objects, rather than words. Yet, Picture-Group Naming helped to define a semantic factor on which none of the behavioral tests using drawings is loaded. Early in this report, it was noted that words need not be semantic nor need pictures be behavioral. Factor NMU found in this analysis lends support to this distinction, as well as to the interpretation of the behavioral-cognition factors as ability isolates rather than format factors.

The semantic-ordering factor, NMS, was assessed in the present study because one of its marker tests, Picture Arrangement, requires E to reorder cartoon strips. The identification of factor NMS in this analysis depended on the high, unique loading of this variable alone. Sentence Order, the other NMS marker test, did not emerge on its hypothesized factor; reasons for this were suggested in the preceding section. The high loading of the cartoon test, Picture Arrangement, however, is sufficient to define the factor for present purposes. All five of the behavioral-cartoon tests (Cartoon Exchange, Cartoon Implications, Cartoon Predictions, Missing Cartoons, and Odd Strip Out) are in the hyperplane of this cartoon-test singlet. In this analysis, the ability to manipulate cartoons would not seem to be a separate ability.

The three figural factors, CFU, CFR, and NFT, were included to determine whether figural or spatial ability were involved in correctly answering the behavioral-cognition tests, since most of the behavioral-test stimuli are in the form of photographs and drawings. Since no behavioral test is significantly loaded on any of the three figural-ability factors, it would seem that spatial factors are not appreciable components of what is measured by the behavioral-cognition tests.

Behavioral Factors

Before discussing the behavioral-cognition factors individually, some general comments about them are in order. Most of the behavioral measures use stimuli not commonly used in aptitude tests. The factors resulting from tests based on such unusual stimuli might be thought to reflect the stimuli used rather than the ability hypothesized. As counter-evidence, the definition of semantic factors by semantic tests using drawn and cartoon material has already been mentioned. In addition, it should be recalled that an attempt was made to control for the emergence of stimulus factors by counterbalancing kind of stimuli over the behavioral-cognition factors. Each of the six behavioral-cognition factors isolated in this analysis is defined by at least two tests having different stimuli. An interpretation of these behavioral-cognition factors as stimulus factors would thus be unfounded.

The behavioral-units factor (CBU), as found in this study, could be interpreted, parsimoniously, as the ability to understand facial expressions. This interpretation would not mean that the behavioral unit need be reconceptualized to exclude gestures, body postures, or inflections. Instead, a format should be used for the units tests that includes more variety of expressions than those used in the present study. More explicitly, each behavioral-units test should be limited to one expressional modality. To test the understanding of inflections, for example, auditory alternatives should be used. The promise for success in using different kinds of expressions in CBU tests is supported by the .27 loading on factor CBU of Stick Figure Opposites, a CBR test. In Stick Figure Opposites, cognition of a given body posture is tested using three body-posture alternatives.

The CBC factor found in this study is defined as reflecting the ability to see similarity of behavioral information in different expressional modes. Theoretically, it should be possible to define a behavioral-classes factor also with tests each of which uses only one expressional mode. However, this aspect was not adequately represented in this study and so it awaits further research.

Sound Meaning, hypothesized to measure factor CBC, was the only test in the present study that used verbal labels for behavioral stimuli, although this practice has been a prevalent one in social-intelligence research. Its loadings in the .20's on the verbal-comprehension and concept-naming factors do not recommend such a procedure.

People vary in their social preferences for either two-person or larger groups. The fact that the present study isolated two independent ability dimensions, CBR and CBS, one dealing with diads and the other with larger social systems, may offer a partial explanation for such preferences. If an individual understands diadic interactions better than he does more complex social situations, it would not be surprising if he were to prefer them. Conversely, if a person prefers diadic relationships, he might learn to understand them better.

People continually maintain diadic relationships. So, the ability reflected by factor CBR is of some importance to everyone. However, in intense diads like those in marriage or individual psychotherapy, individual differences in this kind of behavioral cognition should become more apparent. On the other hand, teachers, lawyers, and business and political leaders, who must understand complex, ongoing social situations, are among the professional groups for whom greater CBS ability would seem required.

The behavioral-transformations factor found in this analysis reflects the ability to redefine behavioral information. In the CBT tests, E must comprehend that the same stimulus may have different intentional or behavioral meanings. This comprehension is in contrast with that required by the CBC tests. In the classes tests, E must cognize that different behavioral stimuli may have the same meaning.

The tests defining the CBT factor seem to require what might be loosely termed flexibility. Tests of such flexibility would seem particularly useful in studying the neurotic process, in which rigidity of response pattern is said to play an important part.

The loading of Who Said It? on the CBT factor brings humor into the general area of cognition. Who Said It?'s reliability is too low to justify future use without revision, but humor conceived as dependent upon an intellectual trait receives some support as a useful hypothesis.

Being able to predict what other people will do is an ability that makes social existence possible. The factor CBI defined in this analysis lends support to the long-held view that there is a distinct ability involved in making predictions of a behavioral nature.

Many social-intelligence experiments have concentrated mainly on "predictive accuracy." Factor CBI, the ability to make behavioral predictions, suggests that these experiments are studying only one of many intellectual abilities relevant to the understanding of others. By confining experimental effort to but one of possibly thirty behavioral abilities, the importance of this one ability would seem to be mistakenly overemphasized.

Limitations of the Behavioral Tests

Before the behavioral-cognition tests are adopted for general use they should be analyzed using populations of other kinds. Although the significant correlations between socio-economic standing and the behavioral-cognition tests might be an artifact due to the presence of gifted students in the sample, they might also indicate a behavioral-test bias that favors members of the dominant culture. Such a bias is not necessarily bad. A minority-group member should be cognizant of majority mores if he is to succeed in the majority culture. This possible limitation of the behavioral tests should not be overlooked, however.

As well as further construct validation on special groups, including minority groups, the predictive or concurrent validity of the behavioral tests must be ascertained before their practical usefulness is assumed. Should such predictive validation be forthcoming, the behavioral tests should be of use in many areas.

Possible Uses of the Behavioral Tests

In studying social intelligence, experimenters could use the behavioral-cognition tests to classify their subjects as being "high" or "low" in social intelligence with reference to samples somewhat larger than the 30 or 40 subjects usually used in such experiments. By having available the means of equating the "highs" of one experiment with the "highs" of a second experiment, some of the previously reported contradictions and inconsistencies in social-intelligence research may be resolved.

The behavioral tests might also be used experimentally as clinical-diagnostic measures or training instruments. In the latter instance, the improvement of the social comprehension of teachers, psychotherapists, salesmen, and others who deal with people may well benefit the social community at large.

Contingent upon the demonstration of predictive or concurrent validity, the behavioral-cognition tests, which tap previously unmeasurable abilities, are promising as possible selectors of salesmen, administrators, teachers, or others whose jobs require skill in social interactions.

Recommended Tests

Each of the following tests [9] is recommended as a measure of its respective behavioral factor on the basis of its reliability and factor saturation.

CBU	Faces Expressions
CBC	*Expression Grouping Picture Exclusion
CBR	*Social Relations Silhouette Relations
CBS	*Missing Pictures *Missing Cartoons
CBT	*Picture Exchange *Social Translations
CBI	*Cartoon Predictions

[9] Revised forms of the tests indicated by an asterisk (*) are available for research purposes from Sheridan Supply Company, P. O. Box 837, Beverly Hills, Calif.

Some of these recommended tests are neither as reliable nor as univocal as is desirable. They are the best marker tests presently available, however, for their respective factors.

In determining predictive validity, the tests Missing Cartoons and Social Translations would probably be most successful. Both of these tests have adequate reliabilities, and between them five of the six behavioral-cognition factors are represented. Missing Cartoons is significantly loaded on factors CBU, CBS, and CBI; Social Translations, on CBR and CBT.

Two other tests that might be useful if practically valid measures are sought are the factor-pure tests, Expression Grouping (a CBC test) and Cartoon Predictions (CBI).

SUMMARY

Social intelligence has long been thought to exist as a unique kind of intellectual ability. However, no tests of this ability have been devised that measure other than verbal intellectual factors. One theory of human intelligence, Guilford's structure-of-intellect model, hypothesizes not one social intelligence, but thirty different factors of behavioral (social) ability. Six of these factors are concerned with behavioral cognition or understanding, the abilities to understand the thoughts, feelings, and intentions of other people. These factors correspond roughly to the domain termed person perception, empathy, or social awareness by other investigators.

In an attempt to measure these six hypothesized behavioral-cognition factors, 23 experimental tests were constructed. Words were employed as little as possible. The stimuli used in most of the tests were photographs, realistic drawings, cartoons, silhouettes, stick figures, and tape-recorded sentences, sounds, and inflections.

These 23 tests, as well as 24 marker tests of 12 previously established factors of semantic and figural ability, were administered to 240 eleventh-grade students who were middle-class Caucasians of at least average intelligence.

After iterated-communality estimates were determined, 33 principal factors were extracted. The first 19 of these were analytically rotated to orthogonal simple structure, positive manifold, and factor interpretability. Eighteen factors, identified as those hypothesized, and a residual factor, were obtained. The 12 reference factors included 6 semantic or verbal ones: verbal comprehension, verbal classification, verbal relations, general reasoning, concept naming, and semantic ordering. Three "creativity" factors, sensitivity to problems, ideational fluency, and originality were also isolated. Speed of closure, figural inductive reasoning, and flexibility of closure, three spatial factors, were identified as well. In addition, the six hypothesized behavioral-cognition factors emerged.

The factor cognition (C) of behavioral (B) units (U) was interpreted as the ability to understand units of expression, such as facial expressions. A classes factor (CBC) seemed to represent the ability to cognize that different modes of expression (gestures, body postures, and facial expressions) have the same dispositional meaning. A third factor (CBR) was defined primarily by tests in which one's understanding of diadic relationships was assessed. The cognition-of-behavioral systems (CBS) factor was interpreted as reflecting the ability to comprehend a social situation or sequence of events. The transformations or redefinition factor (CBT) indicated that the ability to reinterpret either a gesture, a facial expression, a statement, or a whole social situation is unique. The sixth behavioral-cognition factor, CBI, is concerned with the ability to draw implications, to make predictions about what will happen following a given social situation. Since this predictive-accuracy factor is only one ability, much research in social perception that is confined to predictions is overly concerned with a narrow range of ability when a much broader spectrum exists.

Construct validity such as the present study has provided for the behavioral-intelligence tests does not guarantee predictive validity. Obviously, practical usefulness depends on the latter. Should predictive validity be established, however, these objectively scored, reliable, construct-valid tests might serve as criterion measures of social intelligence, diagnostic techniques in a clinical setting, job-selection instruments, or training devices, to mention but a few possibilities.

REFERENCES

Adkins, Dorothy C. & Lyerly, S. B. Factor analysis of reasoning tests. Chapel Hill, N. C.: Univer. North Carolina, 1951.

Allport, G. W. & Odbert, H. S. Trait-names: a psycholexical study. Psychol. Monogr., 1936, 27, No. 1 (Whole No. 211).

Bannister, Constance. Baby; a photographic inquiry into certain private opinions. New York: Simon & Schuster, 1950.

Bannister, Constance. Senator, I'm glad you asked me that. Philadelphia: Edward Stern & Co., 1952.

Bennett, G. K., Seashore, H. G., & Wesman, A. G. Differential aptitude tests. (3rd ed.) New York: The Psychological Corp., 1959.

Berger, R. M., Guilford, J. P., & Christensen, P. R. A factor-analytic study of planning abilities. Psychol. Monogr., 1957, 71, No. 6 (Whole No. 435).

Boring, E. G. & Titchener, E. B. A model for the demonstration of expression. Amer. J. Psychol., 1923, 34, 471-485.

Bronfenbrenner, U., Harding, J., & Gallwey, Mary. The measurement of skill in social perception. In D. McClelland, A. Baldwin, U. Bronfenbrenner, and F. Strodtbeck (Eds.) Talent and society. Princeton, N. J.: Van Nostrand, 1958.

Buzby, D. E. The interpretation of facial expression. Amer. J. Psychol., 1924, 35, 602-604.

Carroll, J. B. The nature of the data, or how to choose a correlation coefficient. Psychometrika, 1961, 26, 347-372.

Christensen, P. R., Guilford, J. P., & Wilson, R. C. Relations of creative responses to working time and instructions. J. exp. Psychol., 53, 1957, 82-88.

Cliff, N. Orthogonal rotations to congruence. Amer. Psychologist, 1964, 19, 582. (Abstract)

Cline, M. G. The influence of social context on the perception of faces. J. Pers., 1956, 25, 142-158.

Cline, V.B. & Richards, Jr., J.M. Accuracy of interpersonal perception - a general trait? J. abnorm. soc. Psychol., 1960, 60, 1-7.

Dunlap, K. The role of eye-muscles and mouth-muscles in the expression of emotions. Genet. Psychol. Monogr., 1927, 2, No. 3.

Eisenberg, P. & Zalowitz, E. Judgments of dominance feelings from phonograph records of voice. J. appl. Psychol., 1938, 22, 620-631.

Engen, T., Levy, N., & Schlosberg, H. A new series of facial expressions. Amer. Psychologist, 1957, 12, 264-266.

Engen, T., Levy, N., & Schlosberg, H. The dimensional analysis of a new series of facial expressions. J. exp. Psychol., 1958, 55, 454-458.

Fay, L.J. & Middleton, W.C. Judgment of introversion from the transcribed voice. Quart. J. Speech, 1942, 28, 226-228.

Foa, U.G. The structure of interpersonal behavior in the dyad. In Criswell, Joan H., Solomon, H., and Suppes, P. (Eds.) Mathematical methods in small group processes. Stanford, Calif.: Stanford Univer. Press, 1962.

Gage, N.L. Judging interests from expressive behavior. Psychol. Monogr., 1952, 66, No. 18 (Whole No. 350).

Guilford, J.P. When not to factor analyze. Psychol. Bull., 1952, 49, 26-37.

Guilford, J.P. Les dimensions de l'intellect. In H. Laugier (Ed.) L'analyse factorielle et ses applications. Paris: Centre National de la Recherche Scientifique, 1956.

Guilford, J.P. The structure of intellect. Psychol. Bull., 1956, 53, 267-293.

Guilford, J.P. A revised structure of intellect. Rep. psychol. Lab., No. 19. Los Angeles: Univer. Southern Calif., 1957.

Guilford, J.P. Basic traits in intellectual performances. In C.W. Taylor (Ed.) Second research conference on identification of creative scientific talent. Salt Lake City: Univer. Utah, 1958.

Guilford, J.P. Three faces of intellect. Amer. Psychologist, 1959, 14, 469-479.

Guilford, J.P. & Christensen, P.R. A factor-analytic study of verbal fluency. Rep. psychol. Lab., No. 17. Los Angeles: Univer. Southern Calif., 1956.

Guilford, J.P., Green, R.F., & Christensen, P.R. A factor-analytic study of reasoning abilities. II. Administration of tests and analysis of results. Rep. psychol. Lab., No. 3. Los Angeles: Univer. Southern Calif., 1951.

Guilford, J.P. & Merrifield, P.R. The structure of intellect model: its uses and implications. Rep. psychol. Lab., No. 24. Los Angeles: Univer. Southern Calif., 1960.

Guilford, J.P., Merrifield, P.R., Christensen, P.R., & Frick, J.W. Some new symbolic factors of cognition and convergent production. Educ. psychol. Measmt, 1961, 21, 515-541.

Guilford, J.P., Merrifield, P.R., & Cox, Anna B. Creative thinking in children at the junior high school levels. Rep. psychol. Lab., No. 26. Los Angeles: Univer. Southern Calif., 1961.

Guilford, J.P., Wilson, R.C., & Christensen, P.R. A factor-analytic study of creative thinking. II. Administration of tests and analysis of results. Rep. psychol. Lab., No. 8. Los Angeles: Univer. Southern Calif., 1952.

Halsman, P. The Frenchman. New York: Simon & Schuster, 1949.

Hertzka, A.F., Guilford, J.P., Christensen, P.R., & Berger, R.M. A factor-analytic study of evaluative abilities. Educ. psychol. Measmt, 1954, 14, 581-597.

Hoepfner, R., Guilford, J.P., & Merrifield, P.R. A factor analysis of the symbolic-evaluation abilities. Rep. psychol. Lab., No. 33. Los Angeles: Univer. Southern Calif., 1964.

Hollingshead, A.B. & Redlich, F.C. Social class and mental illness: a community study. New York: Wiley, 1958.

Hulin, W.S. & Katz, D. The Frois-Wittman pictures of facial expression. J. exp. Psychol., 1935, 18, 482-498.

Jenness, A. The recognition of facial expressions of emotions. Psychol. Bull., 1932, 29, 324-350.

Kerr, W.A. The primary empathic abilities, form A. Chicago: Psychometric Affiliates, 1957.

Kettner, N.W., Guilford, J.P., & Christensen, P.R. A factor-analytic study across the domains of reasoning, creativity, and evaluation. Psychol. Monogr., 1959, 73, No. 9 (Whole No. 479).

Knapp, R.H. Group and individual differences in the interpretation of diadic silhouettes. Paper read at Western Psychol. Ass., Santa Monica, Calif., April, 1963.

Kramer, E. Judgments of personal characteristics and emotions from nonverbal properties of speech. Psychol. Bull., 1963, 4, 408-420.

Krout, M.H. Autistic gestures: an experimental study in symbolic movement. Psychol. Monogr., 1935, 46, No. 4 (Whole No. 208).

Lamke, T.A. & Nelson, M.J. The Henmon-Nelson tests of mental ability, form A. New York: Houghton-Mifflin, 1957.

Landis, C. A preliminary study of facial expression. J. exp. Psychol., 1924, 7, 325-341.

Levy, N. & Schlosberg, H. Woodworth scale values of the Lightfoot pictures of facial expression. J. exp. Psychol., 1960, 60, 121-125.

Lindquist, E.F. & Bloomers, P. Iowa tests of educational development: quantitative thinking. Chicago: SRA, 1960.

Mik. "Ferd'nand" comic strip. New York: United Feature Syndicate, 1960, 1961, 1962, 1963, 1964.

Merrifield, P.R., Guilford, J.P., Christensen, P.R., & Frick, J.W. The role of intellectual factors in problem solving. Psychol. Monogr., 1962, 76, No. 10 (Whole No. 529).

Messick, S. & Damarin, F. Cognitive styles and memory for faces. Princeton, N. J.: ETS, 1963.

Moore, O. K. Problem solving and the perception of persons. In R. Taguiri & L. Petrullo (Eds.) Person perception and interpersonal behavior. Stanford, Calif.: Stanford Univer. Press, 1958.

Moss, F. A., Hunt, T., Omwake, K. T., & Bonning, M. M. Social intelligence test. Washington, D. C.: Center for Psychological Services, 1927.

Nihira, K., Guilford, J. P., Hoepfner, R., & Merrifield, P. R. A factor analysis of the semantic-evaluation abilities. Rep. psychol. Lab., No. 32. Los Angeles: Univer. Southern Calif., 1964.

Norman, R. D. The interrelationships among acceptance-rejection, self-other identity, insight into self, and realistic perception of others. J. soc. Psychol., 1953, 37, 205-235.

Petersen, H., Guilford, J. P., Hoepfner, R., & Merrifield, P. R. Determination of "structure-of-intellect" abilities involved in ninth-grade algebra and general mathematics. Rep. psychol. Lab., No. 31. Los Angeles: Univer. Southern Calif., 1963.

Porter, Jr., E. H. An introduction to therapeutic counseling. New York: Houghton-Mifflin, 1950.

Porter, Jr., E. H. & Streich, E. R. Learn to listen effectively. Personal communication, 1963.

Rogers, C. R. Counseling and psychotherapy. New York: Houghton-Mifflin, 1942.

Ruckmick, C. A. A preliminary study of the emotions. Psychol. Monogr., 1921, 30, No. 3 (Whole No. 136).

Sarbin, T. R. & Hardyck, C. D. Conformance in role perception as a personality variable. J. consult. Psychol., 1955, 19, 109-111.

Schacter, S. The psychology of affiliation. Stanford, Calif.: Stanford Univer. Press, 1959.

Schlosberg, H. A description of facial expressions in terms of two dimensions. J. exp. Psychol., 1952, 44, 229-237.

Sears, R. R. Ordinal position in the family as a psychological variable. Amer. sociol. Rev., 1950, 15, 397-401.

Snyder, W. U. (Ed.) Casebook of non-directive counseling. New York: Houghton-Mifflin, 1947.

Taft, R. Some correlates of the ability to make accurate social judgments. Unpublished doctoral dissertation, Univer. California, 1950.

Taft, R. The ability to judge people. Psychol. Bull., 1955, 52, 1-23.

Thurstone, L. L. A factorial study of perception. Psychometr. Monogr., No. 4. Chicago: Univer. Chicago Press, 1944.

Thurstone, L. L. Multiple factor analysis. Chicago: Univer. Chicago Press, 1947.

Thorndike, E. L. Intelligence and its uses. Harper's Mag., 1920, 140, 227-235.

Thorndike, R. L. Factor analysis of social and abstract intelligence. J. educ. Psychol., 1936, 27, 231-233.

Vernon, P. E. Some characteristics of the good judge of personality. J. soc. Psychol., 1933, 4, 42-57.

Wedeck, J. The relationship between personality and psychological ability. Brit. J. Psychol., 1947, 37, 133-151.

Weisgerber, C. A. Accuracy of judging emotional expressions as related to college entrance test scores. J. soc. Psychol., 1956, 44, 233-239.

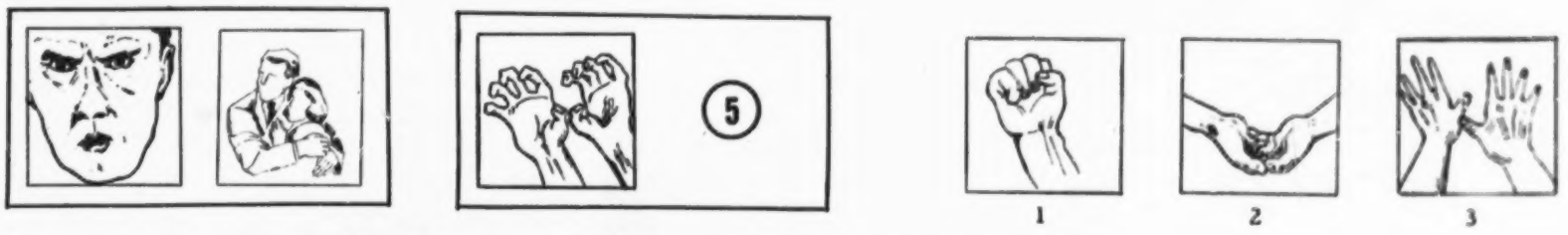
Wolf, R. & Murray, H. A. An experiment in judging personality. J. Psychol., 1937, 3, 345-365.

Woodrow, H. The common factors in fifty-two mental tests. Psychometrika, 1939, 4, 99-107.

APPENDIX A

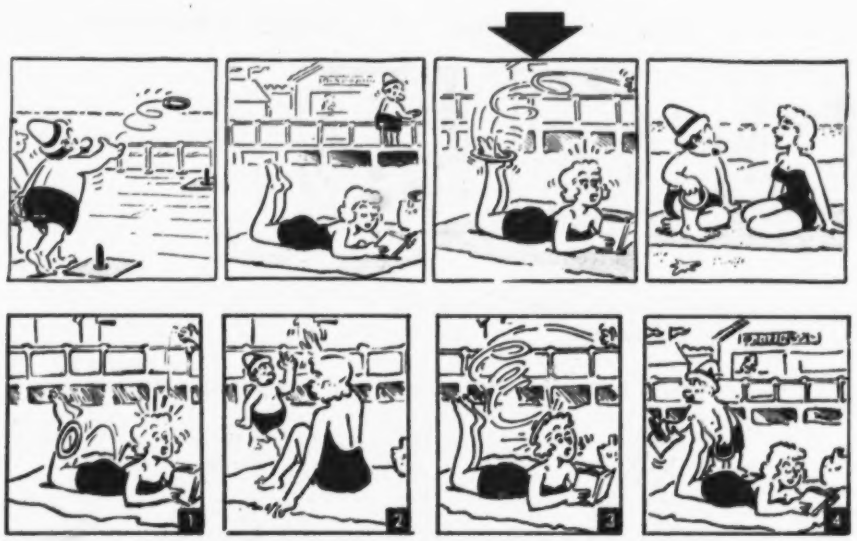
Description of Variables [1]

1. Cartoon Analogies CBR03A. Which alternative expression is related to the third given expression in the same way the second given expression is to the first?



Answer: 3. Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part [2]: 10/15, 12/15; working time: 10 minutes.

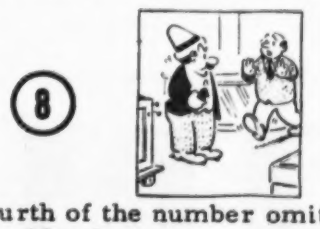
2. Cartoon Exchange CBT01A [3]. Which alternative, when substituted for the cartoon indicated by the arrow, will change the meaning of the story by changing the intentions of the characters?



Answer: 2.
Score: number of items right plus one-fourth of the number omitted.
Parts: 2; items per part: 12/13, 12/13; working time: 16 minutes.

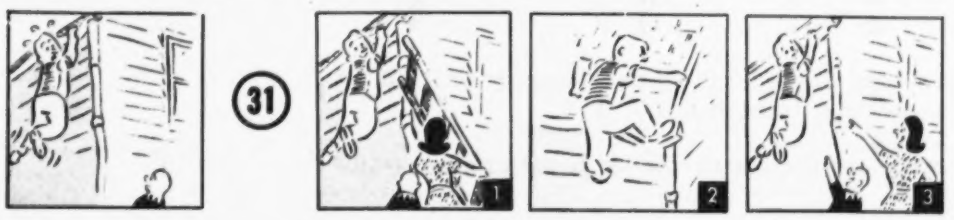
3. Cartoon Implications CBI01A. Which statement describes what happened before, or will happen after the situation shown?

1. The man recognized Ferd'nand as a friend.
2. The salesman will bring a better fitting jacket.
3. The man will say how sorry he is.
4. The man was looking all over for Ferd'nand.



Answer: 3. Score: number of items right plus one-fourth of the number omitted.
Parts: 2; items per part: 18/18, 16/18; working time: 12 minutes.

4. Cartoon Predictions CBI03A. Which alternative situation can be predicted from the given one?



Answer: 1. Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part: 15/15, 14/15; working time: 8 minutes.

5. Consequences - obvious (DMU) [4]. Write as many different results of an unusual situation as possible.

Score: one point for each response that would be a direct result of the given situation, including very general results. Parts: 4; items per part: 1; working time: 8 minutes.

---

[1] Drawn and photographed stimuli are 25 to 50 per cent smaller than actual test size. Circled numbers are item numbers.

[2] Numerator is the number of items scored per part; denominator, the number of items administered.

[3] Ferd'nand cartoons in tests 2, 3, 18, and 21 used by permission of United Feature Syndicate.

[4] Tests 5, 6, 23, 35, and 44 were adapted by permission of Sheridan Supply Company, Beverly Hills, California.

6. Consequences - remote DMT03B. Write as many different results of an unusual situation as possible.

Score: one point for each response that indicates an indirect result or an uncommon adaptation to the given situation. Parts: 4; items per part: 1; working time: 8 minutes.

7. Differential Aptitude Test - Abstract Reasoning (CFR). Choose the one of five alternative figures that completes a four-figure series.

Score: number of items right minus one-fourth of the number wrong. Scores converted to nationally-normed percentiles. Parts: 1; items per part: 50; working time: 25 minutes.

8. Expressions CBU01A. Which alternative expresses the same thought, feeling, or intention as the given?

Answer: 4. Score: number of items right plus one-fourth of the number omitted.
Parts: 2; items per part: 18/18, 14/18; working time: 10 minutes.

9. Expression Exchange CBT04A. Which alternative facial expression changes the meaning of the gesture?

Answer: 2. Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part: 14/15, 14/15; working time: 10 minutes.

10. Expression Grouping CBC04A. Which alternative expression belongs with the given group of expressions?

Answer: 1. Score: number of items right plus one-fourth of the number omitted.
Parts: 2; items per part: 12/15, 14/15; working time: 10 minutes.

11. Faces CBU02A[5] Which man's face expresses the same feeling or intention as the woman's?

Answer: 4. Score: number of items right plus one-fourth of the number omitted.
Parts: 2; items per part: 11/15, 14/15; working time: 8 minutes.

12. Facial Situations CBS03A. Which situation fits the expressions in both photographs?

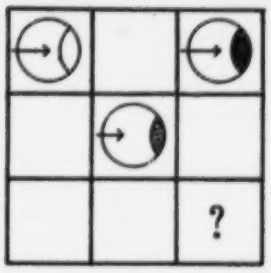
1

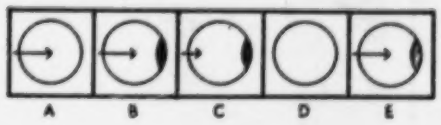
1. He has finally found a job.
2. They are watching a beauty contest.
3. The water is too cold for swimming

Answer: 2. Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part: 11/15, 10/15; working time: 12 minutes.

[5] Lightfoot and Frois-Wittman photographs used in tests 11, 12, and 36 obtained from the Brown University Photo Laboratory.

13. Figure Matrix Test CFR02A. Which alternative figure can be substituted for the question mark in the matrix?



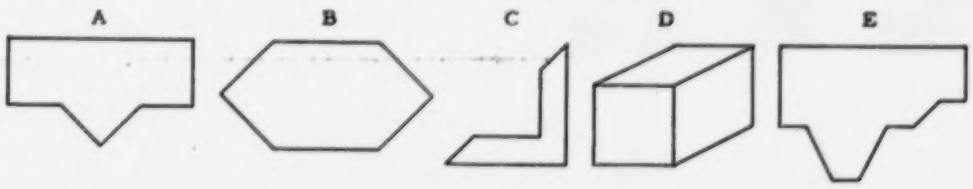


Answer: C.
Score: number of items right plus one-third of the number omitted.
Parts: 1; items per part: 7/8; working time: 3 minutes.

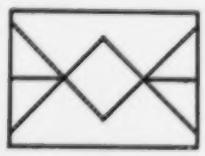
14. Henmon-Nelson Vocabulary (CMU). Which alternative word has the same meaning as the given word? Which alternative correctly completes a given sentence? Items 10, 20, 24, 30, 36, 46, 50, 51, 55, 68, 71, 73, 75, 76, 79, 81, 83, 85, 87, and 89 of the Henmon-Nelson Tests of Mental Ability, Form A were scored as measures of the verbal-comprehension factor.

Score: number of items right plus one-fifth of the number omitted.
Parts: 1; items per part: 20/90; working time; 30 minutes.

15. Hidden Figures NFT04A. Which one of the Five Basic Figures is hidden in the sample item figure?



Sample item.



Answer: A. Score: number of items right minus one-fourth of the number wrong.
Parts: 1; items per part: 15; working time: 3 minutes.

16. Inflections CBU04A (auditory). Which alternative facial expression goes with the inflection of a tape-recorded word or phrase? (Male and female items were alternated.)

Score: number of items right. Parts: 2; items per part: 13/15, 14/15; working time: 12 minutes.

17. Iowa Tests of Educational Development - Quantitative Thinking (CMS). Solve a variety of mathematical problems.

Score: number of items right. Scores converted to nationally-normed percentiles.
Parts: 1; items per part: 53; working time: 40 minutes.

18. Missing Cartoons CBS01A. Which alternative completes the cartoon strip, making sense of the thoughts and feelings of the characters?

Answer: 4. Score: number of items right plus one-fourth of the number omitted.
Parts: 2; items per part: 14; working time: 16 minutes.

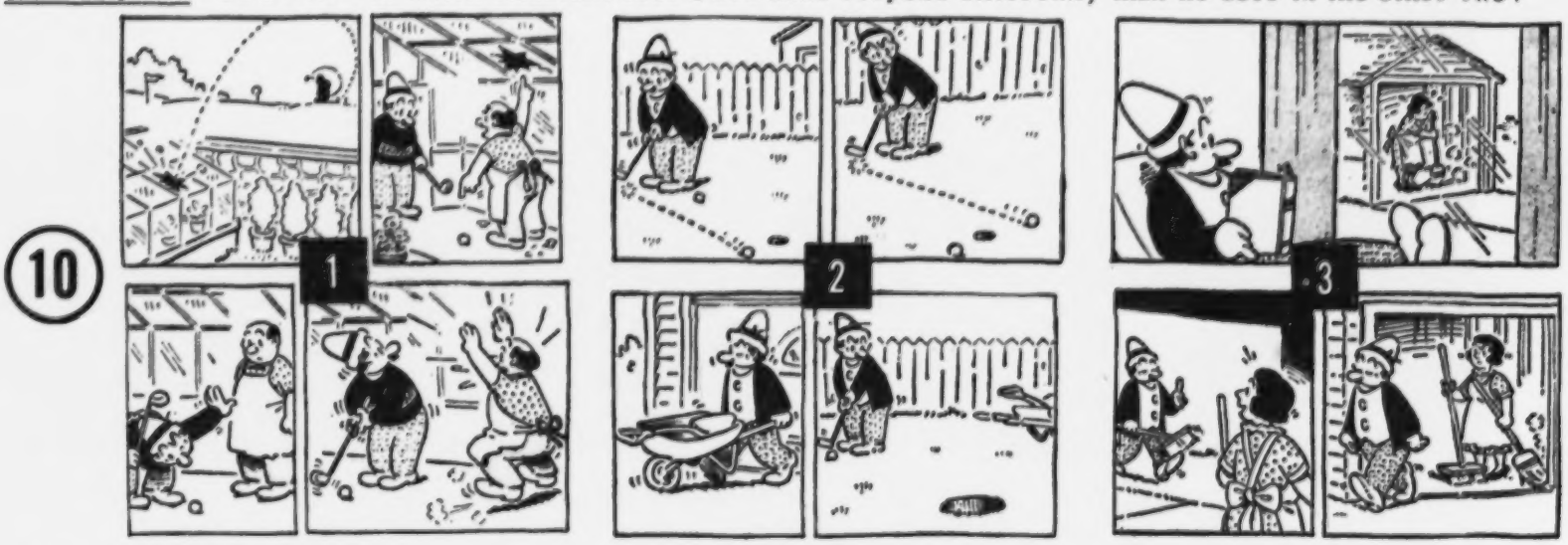
19. Missing Pictures CBS04A. Which alternative completes the story, making sense of the thoughts and feelings of the actors?

Answer: 3.
Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part: 11/14, 10/14; working time: 16 minutes.

20. Mutilated Words CFU03A[6]. Identify words in which parts of each letter are missing.

Answer: house. Score: one point for each correct response.
Parts: 1; items per part: 26; working time: 3 minutes.

21. Odd Strip Out CBC02A. In which situation does Ferd'nand respond differently than he does in the other two?



Answer: 2. Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part: 9/10, 8/10; working time: 12 minutes.

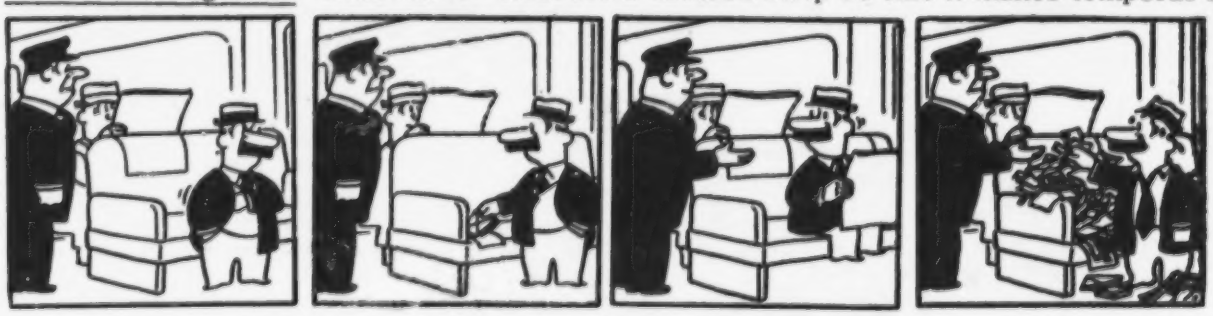
22. Penetration of Camouflage NFT02A[7]. Circle the human faces camouflaged in the lines of a realistic drawing.

Score: one point for each correct response. Parts: 1; items per part: 13; working time: 2 minutes.

23. Pertinent Questions CMI02B. Write four questions the answers to which would serve as a basis for making a decision in a given situation.

Score: one point for each correct response. Parts: 1; items per part: 4; working time: 6 minutes.

24. Picture Arrangement NMS02B[8]. Reorder a cartoon strip so that it makes temporal sense.



2 3 1 4

Score: one point for each completely correct ordering. Parts: 1; items per part: 8; working time: 3 minutes.

[6] Tests 20, 41, and 42 were adapted by permission from tests by L. L. Thurstone.
[7] Adapted by permission from the Army Air Force test of the same name.
[8] Adapted by permission from Dorothy C. Adkins' adaptation of Press Features' cartoon strip LOUIE.

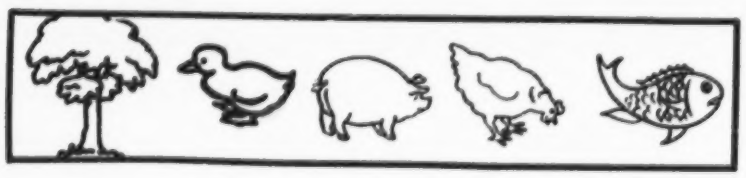
25. Picture Exchange CBT03A. Which alternative, when substituted for the picture indicated by the arrow, will change the meaning of the story?

Answer: 2. Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part: 9/12, 9/12; working time: 16 minutes.

26. Picture Exclusion CBC05A. Which photographed expression does not belong with the other three?

Answer: 3. Score: number of items right plus one-fourth of the number omitted.
Parts: 2; items per part: 10/15; 11/15; working time: 10 minutes.

27. Picture-Group Naming NMU03A [9]. Write a class name for five pictured objects.



living things

Score: one point for each correct response. Parts: 1; items per part: 9; working time: 2 minutes.

28. Plot Titles - low quality DMU05A. Write as many appropriate titles as possible for a given short story (Part 1). Write as many clever titles as possible for a second short story (Part 2).

Score: one point for each title that is relevant but not remote or clever.
Parts: 2; items per part: 1; working time: 7 minutes.

29. Plot Titles - high quality DMT01E. Write as many appropriate titles as possible for a given short story (Part 1). Write as many clever titles as possible for a second short story (Part 2).

Score: one point for each title that is especially succinct or clever, or that indicates a reinterpretation of the plot.
Parts: 2; items per part: 1; working time: 7 minutes.

[9] Tests 27 and 34 were adapted by permission of the University of North Carolina and the Office of the Adjutant General.

30. Questions II CBU03A[10]. Which question might result in the pictured expression?

(7)

1. Can you remember the first line of the Constitution?
2. Don't you think that girl's short skirt is a scandal?
3. Isn't that your wife's car?
4. Did you enjoy your vacation?

Answer: 2. Score: number of items right plus one-fourth of the items omitted.
Parts: 2; items per part: 15; working time: 12 minutes.

31. Reflections CBI04A (auditory)[11]. Which alternative statement expresses the attitude or feeling underlying the given statement?

Sample Item 8. "I'm just wondering how I'll act - I mean how things will turn out."

1. She's looking forward to it.
2. She's worried about it.
3. She's interested in how things will work out.

Answer: 2. Score: number of items right. Parts: 3; items per part: 6/7, 5/7, 7/7; working time: 10 minutes.

32. Seeing Problems CMI03A. Write as many as five problems connected with a common object.

Sample item. CANDLE Answers: 1. How to light it.
2. Keeping it from falling over.

Score: one point for each problem concerned with the use, shape, or composition of the given object.
Parts: 1; items per part: 5; working time: 3 minutes.

33. Seeing Trends I NMU01A. Identify the meaningful trend in a group of words.

mouse rat lion pig cow horse elephant

Answer: animals become larger

Score: one point for each correct response. Parts: 1; items per part: 10; working time: 3 minutes.

34. Sentence Order NMS03B. Arrange three sentences in a meaningful order.

2 She bought some food at the market.

3 She returned home and cooked some of the food she had bought.

1 She went to the market.

Score: one point for each completely correct ordering. Parts: 1; items per part: 10; working time: 3 minutes.

35. Ship Destination Test CMS02B. Find the distance of a ship to a port, taking into account the influence of an increasing number of variables.

Score: number of items right minus one-fourth of the number wrong.
Parts: 1; items per part: 48; working time: 8 minutes.

36. Silhouette Relations CBR05A[12]. Which photograph expresses the individual's feeling or intention in the silhouette relationship? In part one of the test, the alternative pictures are of men. In part two, they are of women.

(22)

1

2

3

Answer: 1. Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part: 11/15, 12/15; working time: 10 minutes.

---

[10] Fernandel photographs used by permission of Phillippe Halsman.

[11] Items adapted by permission from material of E. H. Porter, Jr., C. R. Rogers, W. U. Snyder, and E. R. Streich.

[12] Silhouettes adapted by permission of R. H. Knapp.

37. Social Relations CBR02A[13]. Which statement expresses the feeling of the face indicated by the arrow, taking into account the relationship between the faces?

(22)

1) I didn't like that movie very much.
2) What a bore!
3) Who does he think he is, anyway?

Answer: 3. Score: number of items right plus one-third of the number omitted.
Parts: 3; items per part: 5/7, 7/7, 7/7; working time: 6 minutes.

38. Social Translations CBT02A. Between which alternative pair will the given statement have a different intention or meaning?

parent to child

"I don't think so."

1) teacher to student
2) student to teacher
3) student to student

Answer: 2. Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part: 11/12, 12/12; working time: 8 minutes.

39. Sound Meaning CBC06A (auditory). Which one of four words is the best name for a group of three expressive sounds?

Score: number of items right. Parts: 2; items per part: 14/15, 13/15; working time: 14 minutes.

40. Stick Figure Opposites CBR04A. Which stick figure expresses a feeling or intention opposite that of the given one?

(31)

1 2 3

Answer: 2. Score: number of items right plus one-third of the number omitted.
Parts: 2; items per part: 12/15, 13/15; working time: 8 minutes.

41. Street Gestalt Completion CFU05A. Identify pictured objects having missing parts.

Answer: rabbit.
Score: one point for each correct response.
Parts: 1; items per part: 24; working time: 3 minutes.

42. Verbal Analogies I CMR01B. Which alternative is related to the third given word in the same way that the second given word is to the first?

CLOTH : DYE as HOUSE : ___?___

A. shade
B. paint
C. brush
D. wood

Answer: B. Score: number of items right plus one-fourth of the number omitted.
Parts: 1; items per part: 12/15; working time: 4 minutes.

43. Verbal Classification CMC02B. Given two classes of four words each, decide whether each of eight different words belongs to one class or the other or to neither.

COW	___	desk	√	TABLE
HORSE	√	sheep	___	CHAIR
GOAT	___	rocker	√	BOOKCASE
DOG	___	tree	___	LAMP
	√	cat	___	
	___	nose	___	
	___	dresser	√	
	√	donkey	___	

Score: number of items right minus one-half of the number wrong. Parts: 1; items per part: 5; working time: 4 minutes.

[13] Faces adapted by permission of R. H. Knapp.

44. Verbal Comprehension CMU02C (Guilford-Zimmerman Aptitude Survey, Part I). Which one of five alternatives has the same meaning as a given word?

Score: number of items right plus one-fifth of the number omitted.
Parts: 1; items per part: 22/24; working time: 4 minutes.

45. Who Said It? CBT05A[14]. Which baby's expression fits the caption?

Item 7. Another martini? Oh, I really don't think I should.

1 2 3 4

Answer: 3. Score: number of items right plus one-fourth of the number omitted.
Parts: 2; items per part: 10/12, 10/12; working time: 8 minutes.

46. Word Classification CMC01A. Which word does not belong with the others?

Sample item. A. horse B. cow C. man D. flower

Answer: D. Score: number of items right plus one-fourth of the number omitted.
Parts: 1; items per part: 16/20; working time: 4 minutes.

47. Word Matrix Test CMR02A. Which alternative completes the matrix?

Sample item.	ground air	street route	automobile _____	A. airplane B. bird C. kite	D. balloon E. cloud

Answer: A. Score: number of items right. Parts: 1; items per part: 10; working time: 3 1/2 minutes.

48. Sex. Females were assigned the code value 0; males, 1.

49. Sibling Status. Only and oldest children were coded 0; others were coded 1.

50. Socio-Economic Status. Hollingshead's seven-point Socio-Economic Factor index was used as follows: 1, executives and major professionals; 2, managers and lesser professionals; 3, administrative personnel and semi-professionals; 4, clerical workers and technicians; 5, skilled manual employees; 6, semi-skilled employees; 7, unskilled employees.

51. Mental Age (Henmon-Nelson). This "score" was determined in the manner described in the Henmon-Nelson Tests of Mental Ability, Form A manual.

52. Chronological Age. Each examinee's age at the time of testing was determined to the nearest month.

[14] Baby photographs used by permission of Constance Bannister.

APPENDIX B

Target Matrix for Rotated Factors

Tests	CMU	CMC	CMR	CMS	CMI	DMU	DMT	NMU	NMS	CFU	CFR	NFT	CDU	CBC	CBR	CBS	CBT	CBI	Res.
1.															.85				
2.																	.90		
3.																		.70	
4.																		.80	
5.						.70													
6.							.70												
7.											.75								.05
8.													.65						
9.																	.75		
10.														.80					
11.													.70						
12.																.75			
13.											.75								
14.	.75																		
15.												.80							
16.													.75						
17.				.75															
18.																.80			
19.																.80			
20.										.75									
21.																.70			
22.												.80							
23.					.75														
24.									.60										
25.																	.80		
26.														.80					
27.								.75											
28.						.68													
29.							.72												
30.													.80						
31.																		.80	
32.					.75														
33.								.75											
34.									.60										
35.				.75															
36.															.83				
37.															.83				
38.																	.80		
39.														.75					
40.															.80				
41.										.75									
42.			.80																
43.		.85																	
44.	.85																		
45.																	.75		
46.		.80																	
47.			.85																

APPENDIX C

Construction of Behavioral Divergent-Production Tests

The objectives of this research contract included the development of tests for the six factors of behavioral divergent production hypothesized by the structure-of-intellect model: divergent production of behavioral units (DBU), classes (DBC), relations (DBR), systems (DBS), transformations (DBT), and implications (DBI). Such factors should be prominant among abilities important for interpersonal creativity. This phase of the study is based on the results of the behavioral-cognition analysis, in which six parallel abilities were demonstrated, and was initiated during the final stages of that study.

Because of the large numbers of examinees demanded by a factor-analytic study, group testing is a practical necessity. Administration of tests to groups severely restricts the kinds of responses examinees can produce. Written responses, verbal in nature, are usually the most efficient to secure. For this reason, most of the DB (divergent-production-behavioral) tests constructed to date are of the open-end type that require the examinee to give written responses.

One of the findings of the behavioral-cognition phase of this study was further support for the contention that verbal material, which stresses semantic information, is not necessarily restricted to that kind of information. We have demonstrated that verbal material can be used to communicate behavioral information. However, in testing situations where words or other verbal stimuli are used, there is also some danger that semantic variance will be present. Thus, in using verbal response to estimate behavioral ability, great care must be exercised to avoid measuring some semantic ability rather than the behavioral ability in which one is interested.

In developing the DB tests, in which words are used, several precautions were taken in order to minimize semantic variance in the tests. These precautions included the following: (1) making the verbal presentations of items as simple and as clear as possible; (2) structuring the test task so that the examinees need give only very simple verbal responses; (3) extensive training of scorers with respect to the difference between verbal-behavioral and verbal-semantic responses; and most important, (4) the preparation of extensive and explicit scoring guides for each of the DB tests.

Preliminary forms of 18 behavioral-divergent-production tests have been developed. Twelve of these tests have been extensively pretested on four groups of college students (Total N = 120). Certain of these twelve DB tests were administered in combination with marker tests for a wide variety of reference factors. The reference factors represented were CMU, CMI, CBU, CBC, CBS, CBI, DMU, DMS, and DMT.

The twelve behavioral tests given are listed and described below, the letters in parentheses indicating their hypothesized factor content. A brief description of the factors will serve as a review, as they are more fully set out in the body of this report. A Spearman-Brown extension of split-half reliability for each test is in parentheses following the test name.

DBU Tests. (Divergent-production of behavioral units) The emphasis of these tests is on the generation of behavioral units, a behavioral unit being defined as a mental state of a person as manifested by such cues as facial expressions or gestures. The four tests given were:

A. Expressing Emotion (DBU)(r_{tt} = .84).

There are four parts to this test, each part naming an emotion of an individual. E is to write as many different things as he can that a person might say if he were feeling the given emotion.

Sample Item: Write as many things as you can that a person might say if he (or she) were ANGRY.

Possible Answers:

1. I hate you.
2. Get out.
3. Grr.

B. Expression Meaning (DBU)(r_{tt} = .78).

There are two parts to this test, each part describing an action or behavioral gesture of an individual. E is to write as many different meanings as he can for the described action.

Sample Item: If one person winks at another, what could he (or she) be thinking or feeling?

Possible Answers:

1. How about a date?
2. The person is being friendly.
3. The person is kidding.

C. Picture Meanings (DBU)(r_{tt} = .84).

This test consists of three parts, with two items in each part. Each item is a picture of a facial expression or a gesture. E is asked to write as many different things as he can that a person might say if he felt as "the person in the picture does."

D. Sketching Faces (DBU)(r_{tt} = .88).

There are four parts to this test, each part describing a situation or event. E is to sketch as many different facial expressions as he can to show how the person might feel in the situation. In the scoring of these sketches, an attempt is made to score only the expressions suggested, without regard to artistic merit.

Sample Item: A person who has just realized that he has been robbed. Sketch as many different expressions as you can to show how the person might look.

DBS Tests. (Divergent production of behavioral systems) The emphasis in these tests is upon the generation of behavioral systems, where a system can be thought of as a sequence of social behavior or the organization of actions and persons into an interrelated whole. The three tests given were:

A. Character Combinations (DBS)(r_{tt} = .65).

This test consists of four parts, each part consisting of three people who are together in some situation. Each person is described in terms of a specific thought, feeling, or attitude. E is asked to make up as many different situations as he can to account for the thoughts and feelings of all three characters.

Sample Item: A - a man in pain, B - a woman who feels sorry, C - an excited man.

Possible Answers:

1. B has hit a pedestrian, A, with her car. A witness, C, is shouting at her about her carelessness.

2. At a ball game, C gets so excited he throws a bottle hitting and hurting an umpire A. C's wife, B, doesn't like baseball anyway and is sorry for A.

B. Diagrammed Social Situations (DBS)(r_{tt} = .63).

There are four parts to this test, each part being a diagram or map showing the patterns of movement of the two people. One person is represented by a solid line, the other by a broken line. Pauses in the movement of these two people are also indicated on the diagram. E is to write as many explanations as he can to account for the different patterns of movement of the two people in the diagram.

C. Possible Plots (DBS)(r_{tt} = .83).

This test consists of four parts, each part containing the description of a story setting involving three characters. Using only these three characters, E is to write as many developments of the given situation as he can. To be acceptable, each story must account in different ways for the feelings, thoughts, or emotions of all three characters.

Sample Item: Two sisters, A and B, are romantically interested in the same young man, C. One day he comes to their house unexpectedly.

Possible Answers:

1. A and B praise each other to C who becomes more confused than ever about which one he likes better.

2. A tells C that B does not want to see him. Instead of discouraging him, this news makes C all the more interested in B.

DBT Tests. (Divergent production of behavioral transformations) In these tests, the emphasis is on the generation of behavioral transformations, a behavioral transformation being defined as changes or redefinition of interpersonal events. The two tests given were:

A. Cartoon Completions (DBT)(r_{tt} = .43).

This test consists of four parts, each part consisting of the first two or three frames in a Ferd'nand cartoon strip. E is to write as many different endings as he can for the cartoon strip. To be acceptable, an answer should consist of a behavioral response and should make use of the information contained in all of the preceding frames. Also, the responses should show a redefinition of the given plot resulting in an unexpected or witty ending.

B. Social Solutions (DBT)(r_{tt} = .87).

This test consists of six parts, each part briefly outlining a social situation. E is to list as many solutions for each situation as he can. The hypothesis underlying this test is that different solutions invlove redefinition of the given situation.

Sample Item: You are on a weekend trip with a group of friends. Most of them would prefer to spend the day hunting but you would prefer to go fishing. You could:

Possible Answers:

1. Go hunting with them.
2. Tell them to go hunting, while you go fishing.
3. Convince them they will have more fun fishing.

DBI Tests. (Divergent production of behavioral implications) In the DBI tests, the emphasis is on the generation of behavioral implications, a behavioral implication being the extrapolation of information in the form of behavioral antecedants, expectancies or predictions. The three tests given were:

A. Paired Expressions. (DBI)(r_{tt} = .57)

This test is in three parts, each part consisting of an action of one person, A. E is to write as many responses as he can to show how another person, B, might react to A's behavior or expression.

Sample Item: If person A smiles at person B, what will B do?

Possible Answers:

1. Smile back.
2. Look surprised.
3. Say, "You're late."
4. Be embarrassed.

B. Predictions. (DBI)(r_{tt} = .75)

This test consists of two parts, each part describing a situation. E is to write as many different results as he can for the given situation.

Sample Item: What possible results might come about if a person has a spot on his (or her) clothes?

Possible Answers:

1. Critized by mother.
2. Feel uneasy.
3. Be rejected by girl friend.

C. Social Problems. (DBI)(r_{tt} = .71)

This test consists of four parts, each part describing a person in a particular role. E is to write as many different problems as he can that a person in this social role might have. The responses should indicate problems that occur in the person's relationship with others, and should be specific to that particular role.

Sample Item: What are the problems a teacher might have in her (or his) relationship with others?

Possible Answers:

1. "Getting along" with people his own age after being around younger ones.
2. Boring his friends by lecturing to them as he does to his classes.
3. Knowing what to do with students who "flirt" with him.

As previously indicated, only a few of the DB tests were administered to all 120 pretesting examinees. Due to the small size of pretesting samples, as well as the restricted number of marker tests administered in a given pretesting group, any remarks about the DB tests are necessarily tentative. Even with this precaution in mind, however, it would seem that the twelve experimental DB tests are reasonably reliable for experimental purposes. Most of the reliability estimates are in the .70 - .80 range; inter-scorer reliability is usually greater than .85.

With respect to the future factor validity of the DB tests, great caution must accompany interpretations of the pretesting data. Since factor analyses are inappropriate, some idea of the clusters formed by the DB tests may be suggested by inspection of the correlations found among same-factor and different-factor tests. The DBU tests seem to be the most highly intercorrelated of the DB tests constructed to date. The median intercorrelation of three DBU tests is .70. (The test, Sketching Faces, is not at all correlated with the other DBU tests and was not included in the median estimate of intercorrelation.) The median intercorrelations of the DBS, DBT, and DBI tests are, respectively, .44, .44, and .58. In most cases, these median intra-factor correlations are higher than correlations with tests of any other factor, including semantic divergent-production factors. These preliminary findings are most promising, suggesting the existence of a unique set of behavioral divergent-production abilities.